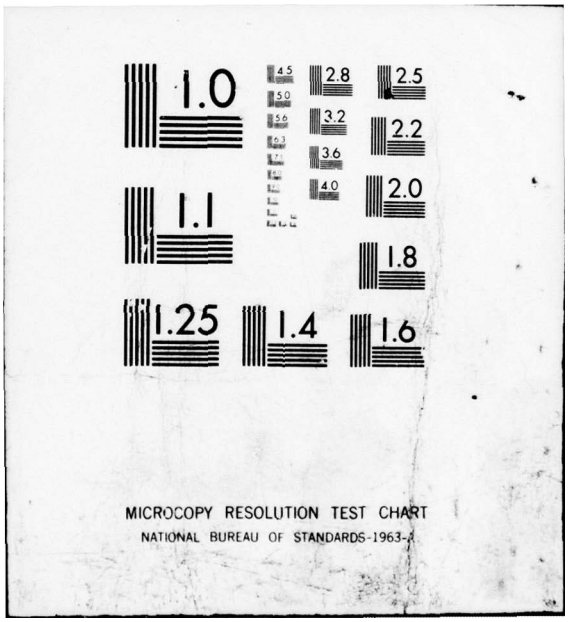
AD-A064 937 BERGER ASSOCIATES INC HARRISBURG PA F/G 13/2
NATIONAL DAM INSPECTION PROGRAM. RINGTOWN NUMBER 6 DAM, SUSQUEH--ETC(U)
SEP 78 DACW31-78-C-0044
UNCLASSIFIED NL

1 OF 1
AD
A064937

END
DATE FILMED
4-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(6) National Dam Inspection Program. Ringtown Number 6 Dam, Susquehanna River Basin, Commonwealth of Pennsylvania, Schuylkill County (NDS-PA-660). Phase I Inspection Report.

LEVEL II (1)

AD A064937

DDC FILE COPY

SUSQUEHANNA RIVER BASIN

RINGTOWN NO. 6 DAM

COMMONWEALTH OF PENNSYLVANIA

SCHUYLKILL COUNTY

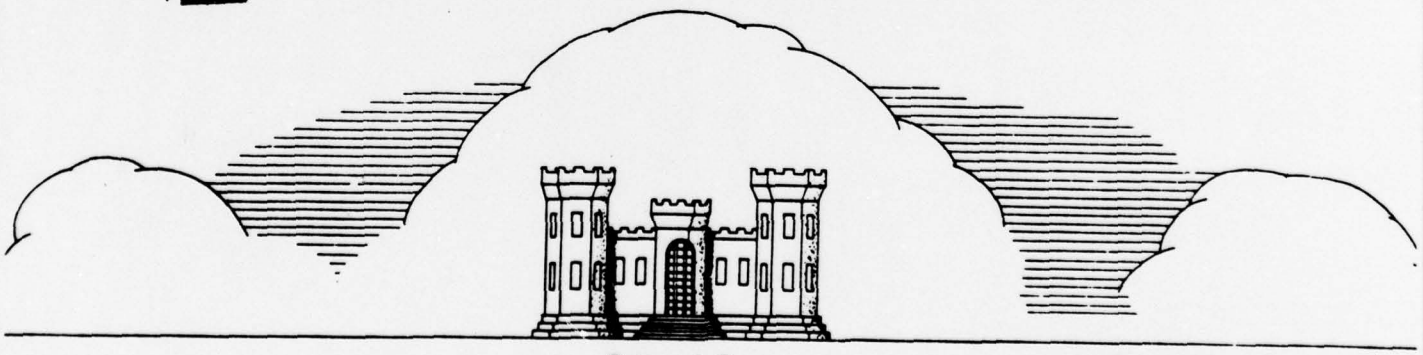
INVENTORY NUMBER NDS PA-660

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

(15) DACW31-78-C-0044

(12) 66p.



Prepared For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland
by
BERGER ASSOCIATES, INC
CONSULTING ENGINEERS
HARRISBURG, PA.

(11) SEPTEMBER 1978

DDC RECEIVED FEB 26 1979 E

DISTRIBUTION STATEMENT A
Approved for public release; Distribution Unlimited

411003

79 02 16 103

127

ACCESSION for
NTIS White Section X
DDC Buff Section
UNANNOUNCED
JUSTIFICATION
per Form 50
BY
DISTRIBUTION/AVAILABILITY CODES
Dist. AVAIL. and/or SPECIAL
A

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	RINGTOWN NO.6
State & State Number:	PENNSYLVANIA, 54-95
County Located:	SCHUYLKILL
Stream:	TRIBUTARY TO LITTLE CATAWISSA CREEK (WHISKEY MILL CREEK)
Date of Inspection:	AUGUST 3, 1978

Based on a visual inspection, past performance and available engineering data, the dam and its appurtenances appear to be in poor condition. The following recommendations are made for action by the owner.

1. That a detailed hydrologic and hydraulic analysis be made for this dam and that the spillway capacity be improved to meet the requirements of that analysis.

2. That heavy weeds, brush and trees be removed from the embankment slopes and that the embankment be inspected by a qualified engineer.

3. That weirs be installed to monitor the seepage of the dam. If seepage increases or if turbidity in the seepage water is discovered, take immediate remedial action.

4. That the spillway slabs and walls be repaired to a satisfactory condition.

5. That the blowoff facility be tested twice a year to insure operable condition.

6. That an entrance to the intake tower be provided and that gates and valves be made operable.

In accordance with the Corps of Engineers' evaluation guidelines, the spillway capacity is inadequate to pass the PMF (Probable Maximum Flood) peak inflow without overtopping the dam. The spillway capacity with the storage capacity is capable of passing only 29 percent of the PMF. The spillway is considered to be seriously inadequate.

79 02 16 103

A formal surveillance and downstream warning system should be developed by the owner to be used during periods of high or prolonged precipitation.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

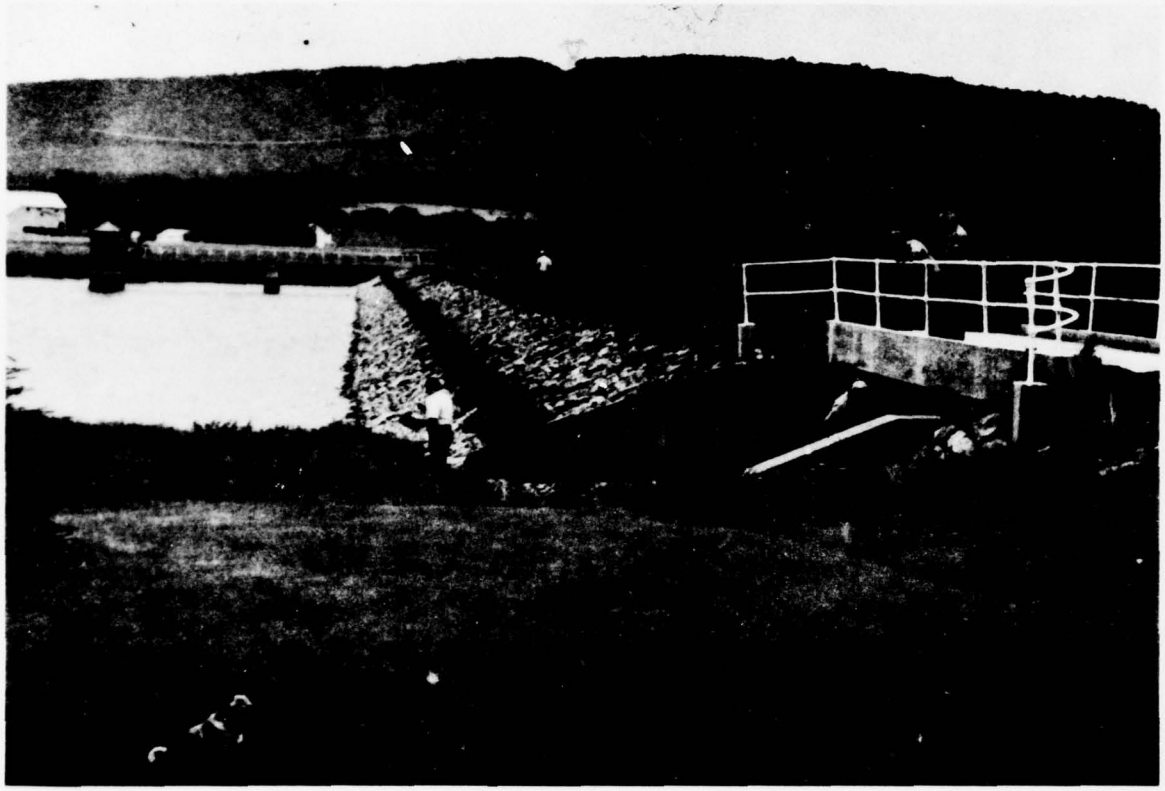
DATE: September 22, 1978

APPROVED BY:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 23 Sep 78

Under the recently revised spillway evaluation guidelines, this dam is considered unsafe, non-emergency.



OVERVIEW

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States. The Phase I Inspection and Report are limited to a review of available data, a visual inspection of the dam site and basic calculations to determine the hydraulic adequacy of the spillway.

B. Purpose

The purpose is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Ringtown No. 6 Dam is an earthfill dam with a height of 50 feet above the streambed. The length of the embankment is 840 feet including a 30-foot broadcrested spillway weir near the right abutment. A trench was excavated on the centerline of the dam to solid rock. After placing a concrete cap in this trench, the underlying rock strata was grouted. A 2.5 foot wide concrete core wall was placed in the trench (Refer to Appendix D, Plate VI) and the trench was puddle filled. The core wall extends to elevation 1117 in the valley and is continued in the side hills (Plate IX, Appendix D).

An intake tower is located near the left abutment and is accessible by a footbridge. A 24-inch blowoff and a 16-inch water supply pipe encased in concrete runs from the intake tower to a screen and valve chamber located at the downstream toe.

The 30-foot long broadcrested spillway weir is five feet below the top of the embankment. The spillway chute consists of a reinforced concrete slab and walls and narrows down to fifteen feet.

B. Location: Union Township, Schuylkill County
U.S. Quadrangle, Ashland, Pa.
Latitude 40°-49.9', Longitude 76°-17.0'
(Appendix D, Plates I and II)

C. Size Classification: Intermediate (height 50 feet).

D. Hazard Classification: High (see Section 3.1.E).

E. Ownership: Municipal Authority of the
Borough of Shenandoah
26-28 West Lloyd Street
Shenandoah, Pennsylvania 17976

F. Purpose: Water Supply

G. Design and Construction History

A permit for the construction of this dam was given on June 3, 1919 by PennDER. Actual construction started on May 19, 1919, and the facilities were completed in the summer of 1921.

The dam was designed by Gannett, Seelye and Fleming and the contractor was Central Construction Corporation, Harrisburg, Pennsylvania. In May, 1920, the construction work was taken over from the contractor and the work was completed by the Girard Water Company, owner of the facilities, under direction of Mr. Kelshaw. The resident engineer was Mr. Reed.

The borrow area was relocated from the reservoir area to the hillside on the right of the dam. Some changes were made during the construction. The concrete corewall as shown on Plate VI, Appendix D, was adjusted to the configuration shown on Plate IX. The intake tower, pipes and valve chamber were relocated about 40 feet to the left to have better foundation for the pipe encasement. Both changes were approved by PennDER.

H. Normal Operating Procedures

The impounded water is used for domestic water supply. Water is taken from the reservoir and flows by gravity in a 16-inch cast iron pipe to Ringtown No.5 Dam (PA-659) where the water either is pumped to Shenandoah or stored in that impoundment.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

Computed for this report	1.95
From Report to Water Supply Commission regarding dam application	2.0

B. Discharge at Dam Site (cubic feet per second)
See Appendix B for hydraulic calculations)

Maximum known flood, June 22, 1972, estimated on basis of nearby gaging stations (peak inflow)	500
24" blowoff at pool Elevation 1155	50
24" blowoff at pool Elevation 1117	20
Spillway capacity at pool Elevation 1160 (top of dam)	1,000

C. Elevation (feet above mean sea level)

Top of dam	1,160
Spillway crest	1,155
Wasteway apron at entrance to stream channel	1,108
Blowoff and outlet pipe invert upstream end, approximately	1,113
Blowoff and outlet pipe invert downstream end, about	1,106
Stream bottom at centerline of dam	1,110
Normal pool	1,155
Maximum tailwater (estimated)	1,115

D. Reservoir (miles)

Length of maximum pool	0.6
Length of normal pool	0.5

E. Storage (acre-feet)

Spillway crest (Elev. 1155)	830
Top of dam (Elev. 1160)	1,075

F. Reservoir Surface (acres)

Top of dam (Elev. 1160)	60
Spillway crest (Elev. 1155)	38

G. Dam

For a typical section see Appendix D, Plate VII.

Type: Rolled homogeneous earthfill.

Length: 840 feet.

Height: 50 feet above streambed.
84 feet above lowest point of core wall.

Top Width: 16 feet.

Side Slopes: Upstream - 2.5H to 1V
Downstream - 2H to 1V with a 5-foot berm

Zoning: None.

Cutoff: Cutoff trench excavated near centerline dam. Trench width of 8-feet - 6-inches and varying depth (maximum 36 feet). Trench filled with concrete core wall and puddle filled select material.

Grout curtain: 2-inch holes drilled at 6 feet centers and 25 feet deep.

H. Outlet Facilities

The upstream end of the outlet facilities is housed in an intake tower located approximately 120 feet upstream from the centerline of the dam. This intake tower is connected to the top of dam by a two-span concrete bridge. Inside the intake tower is the valve end of the 16-inch water supply intake pipe and the 24-inch blowoff pipe which go through the dam. However, these valves have not been operated for at least 25 years. An underwater intake chamber, divided into two parts, provides diversion of water to each outlet pipe. The intake chamber is adjacent to the tower. Each part of the intake chamber has its own rectangular inlet opening and the openings are protected by removable iron bars. The sill of the water supply intake opening sits approximately 12 feet above the reservoir bottom while the sill of the blowoff opening sits on the reservoir bottom. A 15-inch by 15-inch sluice gate on the wall between the two portions of the intake chamber would allow flow to enter either outlet facility from the adjacent opening if required. The downstream ends of the outlet pipes are valved again in a small structure at the downstream toe of the dam. The 16-inch water supply pipe carries water to the Ringtown Dam No.5

The 24-inch blowoff valve has not been operated in at least 25 years. The 16-inch water supply intake is always open. Entrance to the intake tower cannot be made as the door is jammed and has been jammed for some time.

I. Spillway

Type: The spillway is a concrete chute having an approach channel lined with a concrete bottom and wingwalls and a broad crested weir as a control. Just downstream from the weir is a drop of approximately 3 feet. A sloping concrete chute connects the weir to the wasteway apron where the spillway flow enters the original channel. Also, there is a very rough horizontal wasteway apron which dissipates the discharge energy before re-entry of the water into the original stream channel.

Length: The weir has a length of 30 feet and is bounded by 5-foot-high concrete walls.

Crest elevation: 1155.

Upstream channel: The spillway receives water from an approach channel lined with a gravel and concrete bottom and slightly flared concrete wingwalls and is approximately 30-feet wide and 20-feet long. Further upstream the right bank of the lake and the dam embankment on the left act to guide flow to this approach channel.

Downstream channel: The concrete chute downstream from the crest drops off suddenly under the bridge (Sheet 1, Appendix B). This was not shown on the spillway design drawing (Plate VI, Appendix D) and was a change during construction. After this drop of approximately 3 feet, the slope is relatively flat and then passes through another but steeper slope change before terminating on a horizontal concrete and stone apron at the downstream streambed. Energy dissipation takes place on the concrete apron assisted by tailwater from the downstream natural channel. The chute has a total length of 340 feet with a total fall of 47 feet. Its maximum size is 30-feet in width by 5-feet high and its minimum near the wasteway apron is 15 feet in width by 3 feet high. The apron joins the stream 160 feet downstream from the toe of the dam. The natural channel is very small, approximately 10-feet in width, with a relatively flat floodplain heavily overgrown with brush, weeds and trees.

J. Regulating Outlets

See Paragraph 1.3.H.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

A. Data Available

1. Hydrology and Hydraulics

The files of Pennsylvania Department of Environmental Resources (PennDER) did not contain a hydrologic or hydraulic analysis for this dam. The permit application report stated the drainage area of two square miles would have an estimated runoff of 1050 cfs. The spillway discharge capacity was calculated as 650 cfs, with four feet depth.

2. Embankment

The available data for the embankment consists of the design drawings. No analysis or soil test data was available for review. Plate VI, Appendix D, indicates that five holes were drilled and four test pits (shafts) were dug. Inspection and progress reports describe the excavation and depth of the cutoff trench.

3. Appurtenant Structures

Design criteria and design calculations for the appurtenant structures were not available in the PennDER files. Details of the structures are detailed on the design drawings.

B. Design Features

1. Embankment

The embankment area was stripped and a cutoff trench was located near the centerline of the dam. This trench was excavated through the overburden and the red shale which contained crevices until the bottom reached hard solid shale. After placing a concrete cap in the bottom of the trench, 2-inch grout holes were drilled at 6-feet centers and grouted. The reports indicate that these 25 foot deep grout holes took an average of 3.4 barrels of cement. A concrete core wall was placed in the middle of the trench and after stripping the forms, the trench was puddle filled with select material (a mixture of clay, sand and gravel). The embankment was constructed in horizontal layers of 8-inches maximum and harrowed.

The upstream slope (2.5H to 1V) is protected with a layer of hand placed stones 15 inches in length dimensions, seated upon a 6-inch layer of broken stone or gravel and all interstices filled with

spalls tightly wedged into place. In order to hold the stones in place, a concrete wall 18-inches thick and 36-inches deep is placed along the entire upstream toe of the embankment. The crest and downstream slope are seeded. The downstream slope (2H to 1V) has a 5-foot-wide stone-paved berm at elevation 1137±.

2. Appurtenant Structures

The intake structure was to be founded on rock. The actual location is 40 feet to the left from what is shown on Plate VI, Appendix D. It was constructed of reinforced concrete with a varying cross section and a stone masonry building is enclosing the operator stands for the valves. Access to the tower is provided by a two-span concrete bridge. Two pipes encased in concrete and with seepage collars connect the tower with a screen, and valve chamber located at the downstream toe. This structure is constructed with concrete, reinforced with wire mesh.

The spillway, which is located near the extreme right hand end of the dam is 30 feet wide and 5 feet below the crest of the embankment. The bottom and side walls are constructed of reinforced concrete, as is the wasteway, except at the entrance and at the bottom or apron which has 12-inch paving stone set in mortar. The wasteway is carried down the hillside beyond the embankment and enters the stream at a point about 160 feet below the toe of the dam. The reinforced concrete floor and side walls of the spillway are 12 inches thick and carried at this dimension throughout the entire length of the wasteway. The depth and width of the wasteway gradually decreases towards the bottom or lower end where it has a depth of 3 feet and a width of 15 feet, the difference in elevation between the bottom and the top of the wasteway is 47 feet in a distance of 340 feet. The spillway is provided with a small concrete cutoff wall resting on rock foundation and is spanned by a bridge supported on the abutments of the spillway.

C. Design Data

1. Hydrology and Hydraulics

PennDER's files did not contain any hydrologic or hydraulic design data except that the permit report stated that the spillway could pass a discharge of 650 cfs, and that sufficient storage was available to handle the estimated runoff of 1050 cfs.

2. Embankment

PennDER's files did not include design data or design criteria for the embankment. Test boring data and results of test pits are shown on the design drawings.

3. Appurtenant Structures

Design criteria or design data for the appurtenant structures were not availabl in the PennDER files.

2.2 CONSTRUCTION

The construction data available for review included the original contract drawings, contract specifications, construction photographs and several progress and inspection reports. The files also contained a drawing indicating progress made till May, 1920, and it shows the actual depth and top elevation of the concrete core wall.

2.3 OPERATION

The purpose of the dam and appurtenant structures is to supply domestic water to the Borough of Shenandoah. All water is gravity fed by a 16-inch pipe to Ringtown No.5 Dam, where the water is pumped to the Borough. Formal records of operation were not available for review.

2.4 EVALUATION

A. Availability

The available engineering data were provided by the Pennsylvania Office of Dams and Encroachments (PennDER).

B. Adequacy

1. Hydrology and Hydraulics

The hydrologic and hydraulic data available for review was too limited to assess the ability of the the spillway to pass the design flow.

2. Embankment

Although no soil data were available of the select embankment material, it is considered that the slopes used in the design are adequate. However, no toe drains or blanket drains were installed in the downstream toe to collect possible seepage water. Although the core wall appears to be founded on good rock in the valley, it appears that this wall was not continued to sufficient depth and height at the abutment. No details were found indicating length of pours and construction joint details. No indication was found that the grout curtain was continued beyond the limits of the embankment fill (Plate IX, Appendix D).

3. Appurtenant Structures

A review of the contract drawings indicates that the appurtenant structures were detailed according to acceptable engineering practice. However, cover on the reinforcing of steel is not shown.

C. Operating Records

No formal operating records were available for review. The dam tender stated that damage occurred in the downstream spillway channel during the tropical storms Agnes (June, 1972). The estimated depth of water over the spillway was four feet.

D. Post Construction Changes

No reported modifications have been made to the embankment. One inspection report stated that additional grouting would be required in the abutment to reduce the leakage. However, no records were found to confirm that this work was done.

E. Seismic Stability

The dam is located in Seismic Zone 1 and it is considered that the static stability with normal safety factors is sufficient to withstand minor earthquake induced dynamic forces. No calculations or studies have been made to confirm this.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

Due to the small amount of maintenance performed at this facility, the general appearance of the dam and appurtenant structures is poor. Some growth is on the upstream slope. Heavy brush covers the downstream slope and the lower third part of this slope is covered by trees, thus preventing a close visual inspection. The visual checklist is in Appendix A. Photographs taken during the inspection are reproduced on Plates III, IV and V, Appendix D.

B. Embankment

The upstream slope is in fairly good condition. Some slight growth between the handplaced riprap was present but the slope was in an acceptable condition. The crest of the dam has good horizontal and vertical alignment and was well maintained. The downstream slope was covered with heavy weeds and brush and the lower third part of the slope had very heavy brush and tree growth. The density of the vegetation prevented close inspection of this slope. Signs of sloughage or movement of the downstream toe were difficult to observe. Seepage was noted near the valve chamber and at the toe at the right abutment (Refer to Sketch 1, Appendix A).

C. Appurtenant Structures

The spillway is located near the right abutment. The pool level at the time of inspection was about 3.5 feet below spillway crest elevation and the forebay area was exposed. A concrete bridge has been constructed over the spillway on the centerline dam, leaving a vertical opening of 5-feet. The forebay area is paved stone with concrete retaining walls. The broadcrested weir has an ogee shaped downstream face (not shown on the plans) and reinforced concrete walls. The spillway chute makes a sharp turn to the left and follows closely the embankment abutment. Considerable cracking of the spillway slab was noticed and some of the reinforced concrete sidewalls have totally disintegrated (Appendix D, Plate IV).

An intake tower is located at the upstream side of the embankment, close to the left abutment. Access to the tower from the breast of the dam is over a footbridge. The bridge was in good condition, but the support on the tower for the bridge has deteriorated considerably. The operating valves are inside the gatehouse. The door of this gatehouse is jammed and cannot be opened. It has not been opened in the last 25

years, according to Mr. Moser, the dam operator. Mr. Moser stated that all five valves in this structure are in open position. A valve and screen chamber is located at the downstream toe. Access is difficult due to the trees. Water was standing in the chamber and the access door had been removed. There are two pipes coming from the intake tower. A 16-inch supply line with a screen pot continues to Ringtown No.5 Dam (PA-659). Valves on this line are left open at all times and flow is controlled at the downstream dam. The 24-inch blowoff line has a valve which has not been used in the past twenty-five years, according to the owner's representative. The outlet channel is overgrown. Opening the blowoff valve would probably damage the supply line, which is laying in the outlet channel. The owner's representative stated that there is a 6-inch blowoff valve on the supply line and this valve had been last opened about 3 years ago.

D. Reservoir Area

The reservoir is surrounded by forests. All banks appeared to be stable and no erosion was noticed. No sedimentation problems were reported by the dam tender, but no survey has been made to confirm this.

E. Downstream Channel

The downstream channel is a natural stream with wooded banks. This creek, known as Whiskey Mill Creek, joins the Little Catawissa Creek approximately 1800 feet downstream of the dam. No houses are located near this stream. From the confluence, Little Catawissa Creek runs northeasterly through a forested area and the first development in the floodplain is located approximately 2 miles further downstream. There are two homes, two garages and a motel located in the floodplain. The hazard category of Ringtown No.6 Dam is considered to be "High" due to the possible additional loss of life in case of dam failure due to overtopping.

3.2 EVALUATION

The observed condition of this project is considered poor. Little or no maintenance of the downstream embankment slope and the appurtenant structures has occurred in recent years. After all brush and trees on the embankment have been removed, a detailed engineering inspection of the downstream slope by the owner's consultant should be scheduled to evaluate the seepage condition. The spillway should be repaired so that it can withstand a high discharge without further damage. The valves and gates should be made operable and the jammed door on the intake tower should be repaired.

SECTION 4 - OPERATINGAL PROCEDURES

4.1 PROCEDURES

An interview with Mr. Moser, caretaker of the dam, indicates that there are no established operational procedures for the dam. The valves on the 16-inch line are left open and regulation occurs at the downstream dam (Ringtown Dam No.5). Due to lack of funds, no maintenance work is done on the embankment or spillway.

4.2 MAINTENANCE OF DAM

During recent years no maintenance has been performed on the downstream slope of the embankment.

4.3 MAINTENANCE OF OPERATING FACILITIES

No maintenance has been done on the spillway since some repairs were made after tropical storm Agnes. The valves on the 24-inch blowoff line appear to be in a very rusty condition.

4.4 WARNING SYSTEM

There is no formal warning system in effect at the present time. The dam caretaker lives at the site near the right abutment and normally is available for surveillance.

4.5 EVALUATION

The present maintenance procedure is very poor or non-existent. Although Mr. Moser is mentioned as the dam caretaker, most of his work is spent on other work for the Authority. The blowoff should be operated on a regular basis to insure an operable condition in time of an emergency.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

Very little information was available on the hydrologic and hydraulic design of the dam. There were no area-capacity curves, frequency curves, unit hydrographs, design storm data, design flood hydrographs, flood routings or spillway rating curves. In-house review reports to the Water Supply Commission on the application of the Girard Water Company, the original owners, did furnish some estimates from the reviewing engineer. The estimated capacity of the spillway was 650 cfs for 4 feet over the crest in this report which recommended approval of the applicant's design.

B. Experience Data

Personnel from the Shenandoah Municipal Authority stated that the June 22, 1972 flood, known as Agnes, was the largest flood observed by them. Transposing the June 1972 peak discharge from a nearby gaging station, Trexler Run, near Ringtown, Pa., has provided an estimate of peak inflow of 500 cfs. No recording gages monitor the water level of the reservoir and the estimate of the depth over the spillway crest recalled by the dam tender could not support the discharge as obtained from this gaging station. This gaging station has a relatively short period of record, fifteen years to the present. The characteristics of the drainage area do appear to closely resemble those of Whiskey Mill Run.

C. Visual Observations

Outlet Facilities: It is understood that the 16-inch water supply pipe is open. The intake tower could not be entered due to a jammed door.

Spillway: The spillway is in fair condition but would probably require a great deal of attention after a major flood since past repairs would probably not sustain high flows without damage again. The sidewalls and bottom surfaces of the chute are spalled by apparent frost action in several places and some of the joints in the paving are filled with vegetation. The bridge over the spillway on the centerline dam is placed on top of the spillway walls and will not affect the spillway capacity.

D. Overtopping Potential

This dam has a size classification of "Intermediate" (50-feet high and maximum storage of 1074 acre-feet) and a hazard potential classification of "High" (See Section 3.1.E).

The recommended Spillway Design Flood (SDF) for a dam with the above classifications is the Probable Maximum Flood (PMF). The PMF peak flow for this site is 5260 cfs. The spillway capacity at top of dam level is 1000 cfs. Hydraulic computations for this report are in Appendix B.

An estimate of the effect of the available storage in the reservoir between the spillway crest and top of dam revealed that the available storage would not decrease the peak sufficiently to enable the spillway to pass the PMF without overtopping.

E. Spillway Adequacy

On the basis of the Corps of Engineers' criteria and guidelines, and the following information, the spillway for this dam is considered to be seriously inadequate.

1. The dam has a "High" hazard potential (See Section 3.1.E).

2. The combined effect of spillway capacity and the reservoir storage is sufficient to pass only 29% of the PMF without overtopping the dam. Refer to Sheet 7 of Appendix B. (criteria requires a full PMF).

3. Since this dam is an earthfill structure, failure of the dam is expected if the dam is overtopped.

4. In the event of dam failure, it is expected that the surve of suddenly released water will increase the loss-of-life hazard downstream over that anticipated just prior to failure.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observation

1. Embankment

The upstream embankment slope appeared structurally in good condition. The horizontal and vertical dam crest alignment was good. The downstream slope was so heavily grown with trees and bushes that no detailed visual observation could be made. Seepage has occurred at the abutments of the embankments since construction was completed. At the time of inspection, seepage was observed but it appeared to be clear and not excessive in quantity.

2. Appurtenant Structures

The spillway walls and slabs are in poor condition over most of the length of the chute. Heavy cracking in the slab and some total disintegration of the walls raises the question whether or not this facility could withstand a high discharge.

B. Design and Construction Data

1. Embankment

Design criteria and design data for the embankment stability were not available in the files. The longitudinal section on Plate VI, Appendix D, indicates the foundation strata and that borings were made. The embankment slopes of the dam appear to be satisfactory for an embankment with the indicated impervious material.

A cutoff trench with a concrete core wall is located near the centerline of the dam. This trench was excavated to solid rock and a grout curtain was installed. Leakage has been reported since 1922 and it appears that the grout curtain was not extended far enough into the abutments. A grout pressure of 60 lbs. was used, but it is questionable if all crevices and fractures in the underlying rock had been sealed using a single curtain at 6-foot centers. Although no design criteria or design analysis were available for review, the design of the embankment is generally considered to be adequate, except that no positive control of seepage by an internal drainage system or zoning has been provided.

2. Appurtenant Structures

The spillway slab and walls consist of a reinforced concrete slab and walls. Serious cracking, spalling and deterioration

has occurred. Although this type of construction is acceptable, it appears that the quality of concrete was not very good, and large parts of the spillway are not considered adequate at this time to withstand large discharges.

C. Operating Records

No formal operating records of spillway discharges are maintained. The maximum discharge recalled by Mr. Moser, the caretaker, occurred during tropical storm Agnes in June, 1972. The water flowed over the spillway walls in the lower part of the chute and the downstream slab was damaged.

Appendix E contains reproductions of some of the inspection reports from PennDER, highlighting the leakage problem at this dam. It appears that leakage varied with the pool level and that some very shallow grouting was done. The method of grouting does not appear to be very satisfactory. The weirs were no longer existing at the time of this inspection.

D. Post Construction Changes

There have been no reported modifications to the present dam, except that some shallow grouting in the hillside was done to reduce seepage through the shale.

E. Seismic Stability

This dam is located in Seismic Zone No.1 and it is considered that the static stability is sufficient to withstand minor earthquake induced dynamic forces. However, no calculations, studies, etc., were made to confirm this conclusion.

SECTION 7 - ASSESSMENTS & RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection, the review of available data and the operational history indicate that this facility is in poor condition and in need of repair and maintenance. The heavy growth on the embankment slope and the deterioration of the spillway chute needs immediate attention. The combination of available storage in the reservoir and the spillway discharge capacity will pass only 29 percent of the Probable Maximum Flood (PMF). In accordance with the Corps of Engineer's guidelines the spillway discharge capacity is considered to be seriously inadequate.

B. Adequacy of Information

The available information is considered to be sufficient to make a reasonable assessment of this project.

C. Urgency

It is considered that the recommendations suggested in this section should be implemented immediately.

D. Necessity for Additional Studies

It is recommended that a detailed hydrologic and hydraulic analysis be made by the owner's consultant. If this analysis confirms the seriously inadequacy of the spillway, immediate steps should be taken to suitably increase the spillway capacity. Attention should also be given to other recommendations in this section.

7.2 RECOMMENDATIONS

A. Facilities

In order to assure a continued satisfactory operation of this dam, the following recommendations are made for action by the owner.

1. That a detailed hydrologic and hydraulic analysis be made by the onwer's consultant with recommendations to improve the discharge capacity of the spillway.

2. That brush, trees and heavy weeds be removed immediately from the embankment slopes. The embankment shall then be inspected by a qualified engineer.

3. That weirs be located as necessary and leakage water be directed as far as practical to these weirs. Regular weir readings should be made and reported. If the owner detects an increase in quantity or any turbidity in the water, necessary remedial action shall be taken immediately.

4. That the spillway slab and walls be repaired to assure safe conditions during high discharges.

5. That the valve on the blowoff pipe be made operable and tested on a twice-a-year basis.

6. That the door in the intake tower be made usable and valves and gates be made operable.

B. Operation and Maintenance Procedures

It is considered important that the following procedures by the owner be adopted:

1. Regular maintenance of the embankment and blowoff facilities.

2. A formal surveillance and downstream warning system should be developed to be used during periods of high precipitation.

APPENDIX A

VISUAL INSPECTION

CHECK LIST - DAM INSPECTION PROGRAM

PHASE I - VISUAL INSPECTION REPORT

NAD NO. 660

PA. ID # 54-95 NAME OF DAM Ringtown No.6 HAZARD CATEGORY High

TYPE OF DAM: Earthfill

LOCATION: Union TOWNSHIP Schuylkill COUNTY, PENNSYLVANIA

INSPECTION DATE 8/3/78 WEATHER Overcast - Cloudy - Warm TEMPERATURE 70° - 80°

INSPECTORS: H. Jongsma, R. Houseal — Water Company
R. Steacy, A. Bartlett — Mike Mack, Bill Gwinn, Charles Dallazia
D. Black — Frank Moser

NORMAL POOL ELEVATION: Todays + 4.5' AT TIME OF INSPECTION:

BREAST ELEVATION: 1160 POOL ELEVATION: - 3.5 Ft.

SPILLWAY ELEVATION: 1155 TAILWATER ELEVATION: None

MAXIMUM RECORDED POOL ELEVATION: 1972 - Spillway + 4'

GENERAL COMMENTS:

Valve house - valves are not operated - they are open - control is downstream.

No.6 flows to No.5 by gravity.

Risk to open blowoff - does not want to open.

Damage to spillway 1972 - 1975.

No formal warning system.

Could not get into tower - steel door is warped - Operator has not been in this tower in at least 15 years.

5 valves inside (10") all open.

Grouted one hole to attempt to seal leakage near right side more than 25 years ago - reduced but did not stop leakage.

Today - water down about 4.5 feet below normal operating level.

DAM NO. NAD 660

VISUAL INSPECTION

EMBANKMENT	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. SURFACE CRACKS	None evident or observed.	
B. UNUSUAL MOVEMENT BEYOND TOE	None evident.	
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	Upstream - o.k. Good condition.	
D. VERTICAL & HORIZONTAL ALIGNMENT OF CREST	Horizontal - Good. Vertical - Good.	
E. RIPRAP FAILURES	No failures - good condition.	
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Right and left abutments toe to existing ground - o.k. Spillway 100'± left of right abutment. The junction with the spillway appears good on both sides.	
G. SEEPAGE	Two locations at toe. Refer to field noted drawing.	
H. DRAINS	None evident.	
J. GAGES & RECORDER	None - Records water levels with tape.	
K. COVER(GROWTH)	Upstream - hand placed riprap - slight growth at waterline. Top - grassed roadway, some stones. Downstream - heavy weed growth - top to bottom Trees on lower one-third of slope.	

DAM NO. NAD 660

VISUAL INSPECTION

OUTLET WORKS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. INTAKE STRUCTURE	Masonry stone housing on concrete base upstream from embankment accessible by concrete footbridge with one intermediate pier between the embankment and the tower. Bridge appears structurally sound. Tower in reasonable condition - signs of weathering.	
B. OUTLET STRUCTURE	Valve box 2 valves - 16" - 24"	
C. OUTLET CHANNEL	Slight - natural stream.	
D. GATES	5 gates.	
E. EMERGENCY GATE	24" Gate. No manpower to open - not opened in 25 years. Blowoff is a 6" of the 16" line in valve house operated in past 2 to 3 years. Blowoff channel is silted.	
F. OPERATION & CONTROL	Intake structure door is jammed. All valves are open.	
G. BRIDGE (ACCESS)	Concrete bridge with railing from embankment to the intake tower. Bridge appears structurally sound. Maintenance includes patching of weathered concrete surfaces.	

DAM NO. NAD 660

VISUAL INSPECTION

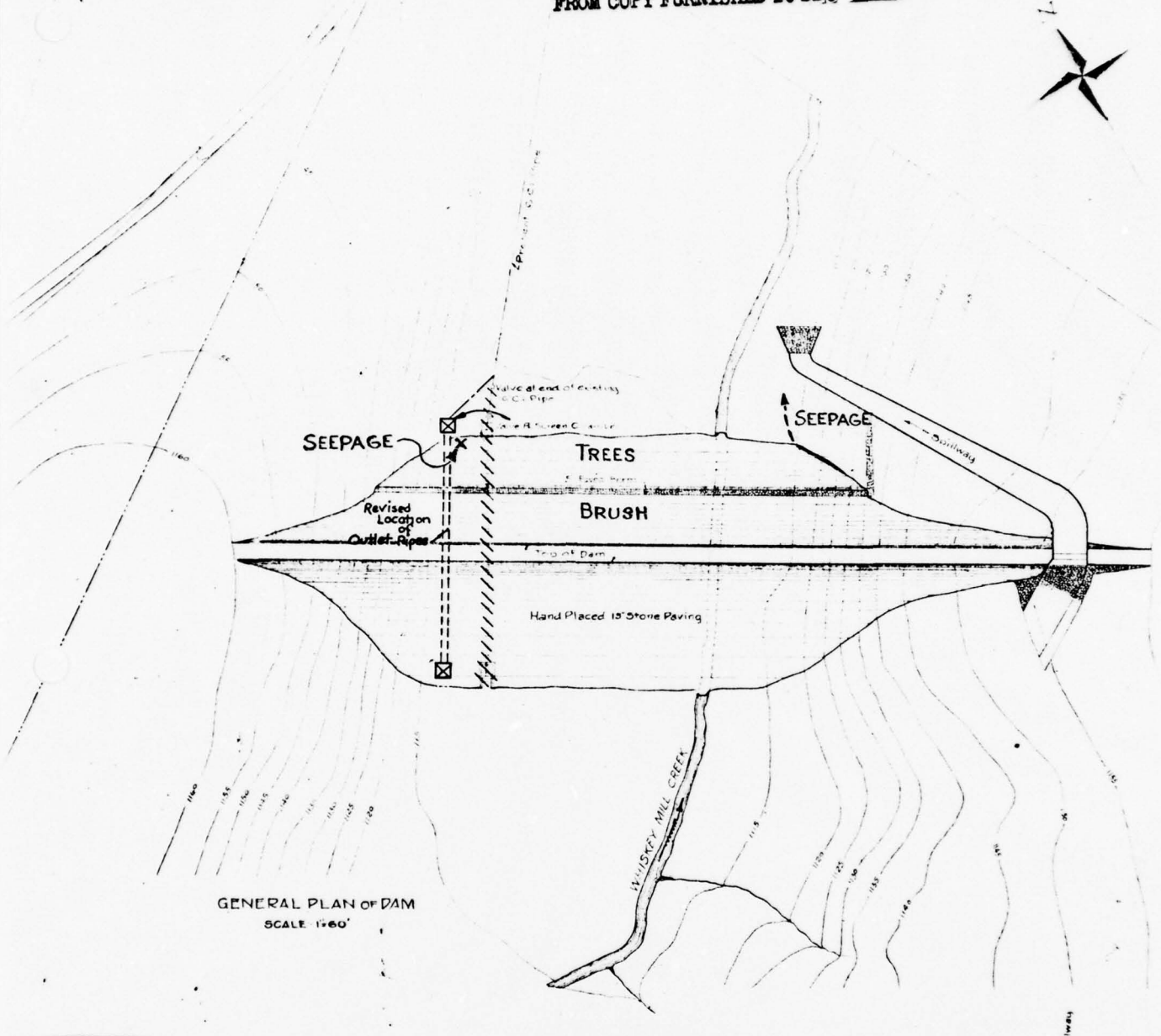
SPILLWAY	OBSERVATIONS	REMARKS & RECOMMENDATIONS
A. APPROACH CHANNEL	Directly from reservoir - left side of embankment. Water not flowing over spillway Approach channel has weed growth at entrance.	
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Broad concrete paved channel with training walls - curved on left side - good condition walls - upstream some weathering.	
C. DISCHARGE CHANNEL Lining Cracks Stilling Basin	Dwonstream - slabs cracked and sealed with tar. Walls fair condition - patched at several locations. Slight weathering. Channel curves to left and descends steep slope to stream channel below. Several places seriously deteriorated.	
D. BRIDGE & PIERS	Concrete bridge over spillway outlet channel Single span.	
E. GATES & OPERATION EQUIPMENT	None	
F. CONTROL & HISTORY	None	

DAM NO. NAD 660

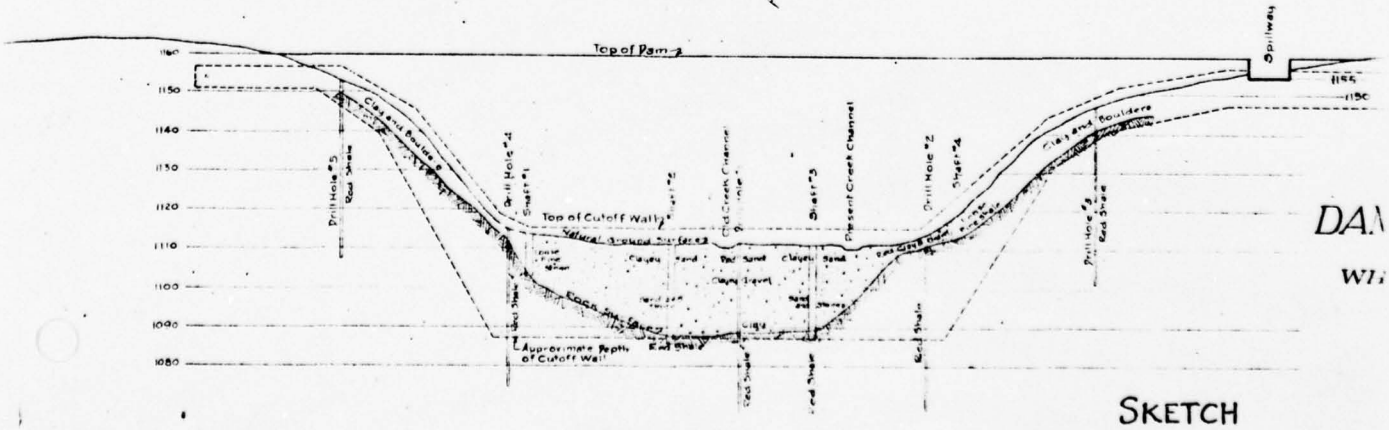
VISUAL INSPECTION

MISCELLANEOUS	OBSERVATIONS	REMARKS & RECOMMENDATIONS
INSTRUMENTATION		
Monumentation	None	
Observation Wells	None	
Weirs	None	
Piezometers	None	
Other	Measurements of water surface taken by tape.	
RESERVOIR		
Slopes	Forest and Farmland	
Sedimentation	None Reported	
DOWNSTREAM CHANNEL		
Condition	Wooded area.	
Slopes	Wooded	
Approximate Population	20	
No. Homes	Two garages, 2 homes and one motel.	

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



GENERAL PLAN OF DAM
SCALE 1"=60'



CROSS SECTION AT SITE OF DAM
SCALES: VERT. 1"=20'
HORIZ. 1"=60'

DA
WI

SKETCH

APPENDIX B

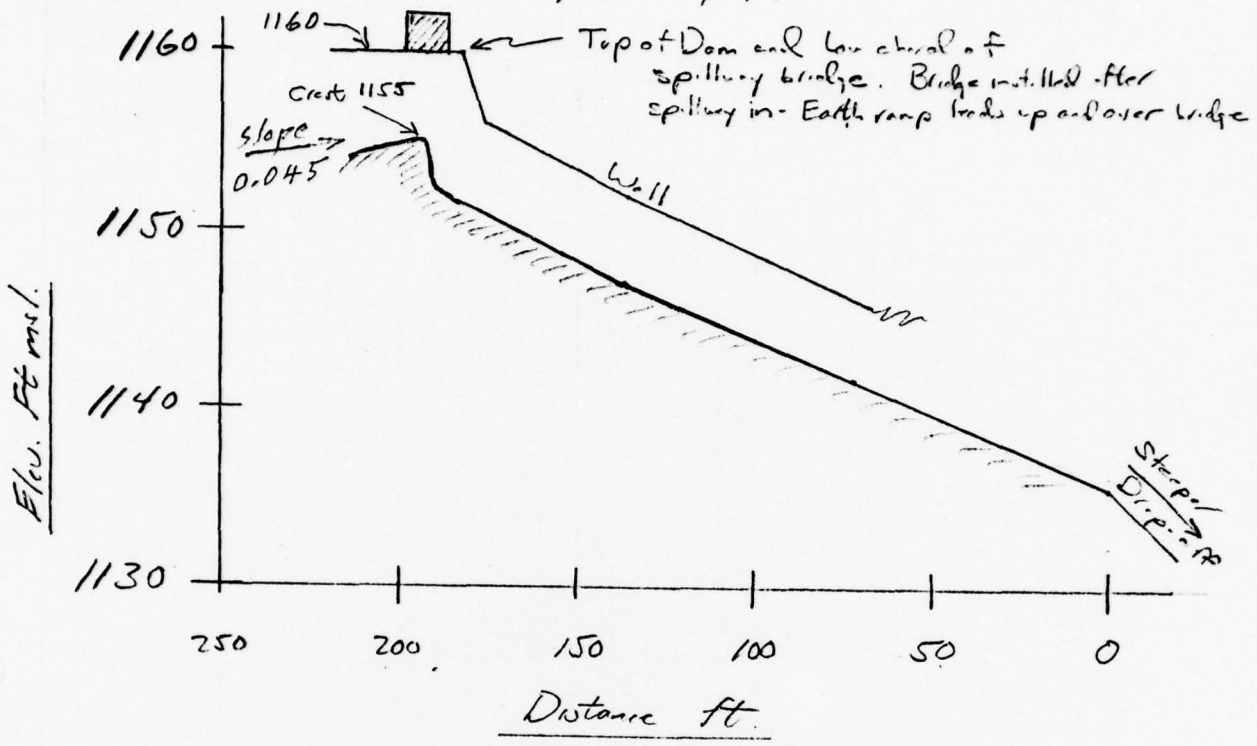
HYDROLOGY/HYDRAULICS

PROJECT Dam Inspection Hts DRI No. G60 SHEET NO. 1 OF 3

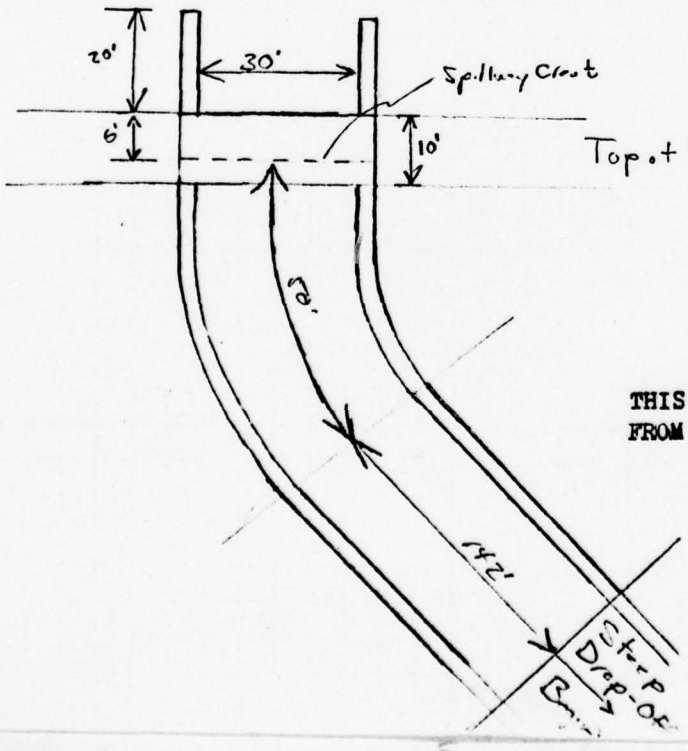
SUBJECT Ringtown Reservoir

COMPUTED BY DJB DATE 7/14/77 CHECKED BY RES 8-18-78

Profile Thru ℄ of Spillway (emergency) as field measured.



Plan Sketch (Not to Scale)



THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

PROJECT Dam Investigation SHEET NO. 6 OF 8

SUBJECT Ringtown Reservoir DAM No. 660

COMPUTED BY DJD DATE 8/14/78 CHECKED BY RES 8-18-78

Discharge of 30' wide rectangular spillway with standard spillway type crest

$Q = CLH^{3/2}$

where $C = 3.0$ Table 5-12 For Eq. 5-11 but modified for this type

$L = 30'$

$H = 5.0'$ (1160-1155)

$Q = 3.0(30)(5)^{3/2}$

$Q = 1000$ cfs

THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

Downstream slope from spillway crest = 5.0'/50' or 0.1 which is sufficiently steep to neglect any possibility of submergence.

Maximum known flood. (Note Catawissa Creek Basin - Tributary to Susquehanna River)

From an examination of gaging stations in the nearby area of the Catawissa Basin the following peak discharges were noted for the June 22, 1972 flood

Station	Name	DA	Q	Q/mi²
*01540200	Trexler Run nr. Ringtown, Pa.	1.77 mi²	487 cfs	275 cfs/mi²
01554500	Shamokin Creek nr. Shamokin Dam Pa	54.2	4070	75
01538000	Wapwallopen Creek nr. Wapwallopen, Pa.	43.8	5410	123

* The closest of the above gages to the reservoir site. Use this gage as it lies in the valley just one mountain over to the valley of the dam

PROJECT Dam Inspection SHEET NO. 2 OF 6
SUBJECT Kimsey Run Reservoir, LRI: No. 440
COMPUTED BY DCB DATE 2/14/78 CHECKED BY REG 8-18-78

Maximum Known Flood (cont'd)

Using drainage area proportionment formula

$$\frac{Q_1}{Q_2} = \left[\frac{A_1}{A_2}\right]^{0.8}$$

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

$$\frac{Q_1}{487} = \left[\frac{1.95}{1.75}\right]^{0.8}$$

$$Q = (1.09)(487)$$

$$Q = 530 \text{ cfs}$$

Thus Peak inflow at Drusher's Run = 530 cfs in 1972

No recording gages monitor the water level of the reservoir ~~[illegible]~~ however the dam tender for the Shenandoah Municipal Authority who lives on the right bank reported observing 4' of water over the spillway crest in June 1972 which was the highest flood during the past twenty five years.

With $Q = CLH^{3/2}$

$$Q = 3.0(30)(4)^{3/2} = 720 \text{ cfs}$$

This observation seems high in light of the records for the gaging stations in the area. Without precise measurement over crest this discharge computation could easily be off.

It is recommended that the figure of about 500 cfs for June 22, 1972 be used as the maximum known flood for this dam.

PROJECT Dam Construction SHEET NO. 7 OF 8

SUBJECT Riactown Reservoir Dam No. 660

COMPUTED BY DSB DATE 8/14/78 CHECKED BY RES 8-18-78

Probable Maximum Flood Q

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

From Department of the Army
U.S. Army Corps of Engineers (8/2/78 - 7:00 P.M.)

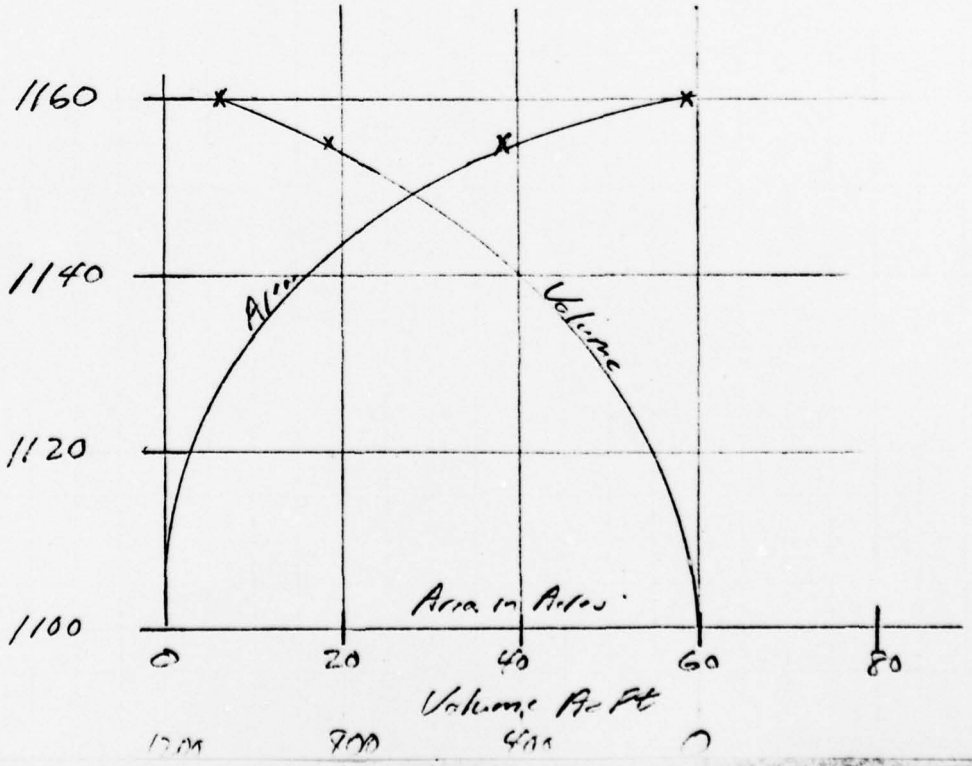
Use PMF Region 2. from PMF $\frac{\text{Peak flow}}{\text{mi}^2}$ vs mi^2

for drainage area = 1.95 mi^2 PMF = 2700 cfs/mi^2

or PMF = 5260 cfs, $\frac{1}{2}$ PMF = 2630

Reservoir Storage Area and Capacity (derived from files and measurement)

Elev.	Area (acres)	Volume (ac-ft)	
1112	0	0	Streambed @ E of Dam
1155	38.4	829	Crest of Spillway
1160	59.7	1074	Top of Dam



PROJECT Dam Inventory Program SHEET NO. 2 OF 3

SUBJECT Kingstown Reservoir No. 6 Dam No 660

COMPUTED BY BJB DATE 8/14/78 CHECKED BY REL-8-18-78

Overtopping Potential

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

For PMF

$$\frac{\text{Maximum Spillway Discharge}}{\text{Peak PMF Flow}} = \frac{1000\ \text{cfs}}{5260\ \text{cfs}} = 0.19$$

Using above ratio enter Short Cut Reservoir Routing Method furnished by Baltimore District U.S. Army Corps of Engineers and obtain

$$\frac{\text{Required Reservoir Storage}}{\text{Vol. of PMF Inflow Hyd.}} = 0.81$$

Thus for volume of inflow using 26" of precipitation as complete runoff

$$\text{Acre feet of Runoff} = 26'' \times 1.95\ \text{mi}^2 \times \left(\frac{640\ \text{acres}}{\text{mi}^2} \times \frac{\text{ft}}{12''}\right) \quad (=3.33)$$

$$= 2704\ \text{acre ft.}$$

$$\text{Required Reservoir Storage} = 0.81(2704)$$

$$= 2190\ \text{acre feet}$$

Available storage above spillway crest
$= 1074 - 829 = 245$ acre feet

Thus dam would be overtopped by PMF!

For ½ PMF

$$\frac{\text{Maximum Spillway Discharge}}{\text{Peak ½ PMF Flow}} = \frac{1000}{2630} = 0.38$$

PROJECT Dam Investigation SHEET NO. — OF

SUBJECT Ringtown Reservoir No. 6 DAM NO 660

COMPUTED BY DJB DATE 7/15/79 CHECKED BY RES 8-18-78

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

½ PMF (cont'd)

$$\text{Thus } \frac{\text{Required Reservoir Storage}}{\text{Vol of ½ PMF Inflow}} = 0.62$$

For Volume of Inflow = ½ PMF or ½(26") = 13"

$$\text{Acre Feet of R.O.} = 13" \times 1.95 mi^2 \times \left(\frac{640 \text{ acres}}{mi^2} \times \frac{1 ft}{12"}\right)$$

(53.33)

$$= 1352 \text{ acre feet}$$

Required Reservoir Storage = 0.62 (1352) = 838 acft

Available storage = 245 acre feet

Thus dam would be overtopped by ½ PMF!

Size Classification of This Dam

Storage = Maximum storage to top of dam = 107 f

Ht = Top of Dam - Streambed = 1160 - 1112 = 48 ft.

Thus dam from Table 1 "Recommended Guidelines" is in the lower range of storage and height for the size classification of "Intermediate".

Hazard Potential Classification

The immediate downstream floodplain is unoccupied however the floodplain above Little Catawissa Creek downstream of Drehobl's Run is occupied by 2 houses, 1 motel & 2 gas stations. This is the same damage area effected by possible overtopping of Ringtown No 5

Thus this is a "High Hazard" from Table 2 of Recommended Guidelines and the Spillway Design Flood from Table 3 is the ½ PMF Thus

PROJECT _____ SHEET NO. C

SUBJECT Ringtown Reservoir No. 6 ID No. 660

COMPUTED BY RES DATE 8-18-78 CHECKED BY DJB

0.2 PMF

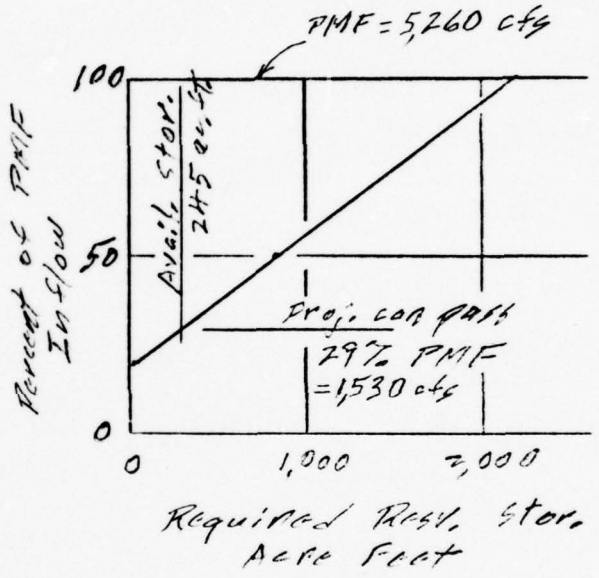
0.2 PMF = 0.2 × 5260 = 1,052 cfs

Runoff = 0.2 × 2704 = 540 acre ft.

$$\frac{\text{Max Spillway Q}}{\text{0.2 PMF Peak Discharge}} = \frac{1000}{1052} = 0.95$$

$$\frac{\text{Req. Resv. Stor.}}{\text{Vol of Inflow}} = 0.05$$

Req. Resv. Stor. = 0.05 × 540 = 27 ac. ft.



This project can pass only 29% of the PMF

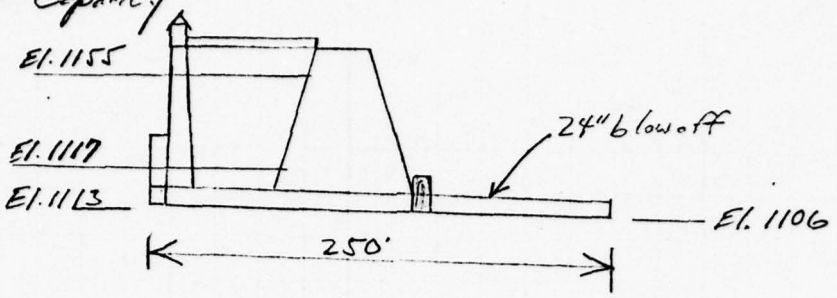
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

PROJECT Dam Investigation SHEET NO. 8 OF 8

SUBJECT Raystown Reservoir Alg. 6 Dam No. 660

COMPUTED BY DJG DATE 8/15/78 CHECKED BY REL 8-18-78

Blow Off Capacity



Capacity at El. 1155

$$Q = \frac{0.463\, D^{8/3} S^{1/2}}{n} = \frac{0.463(2')^{8/3}\left(\frac{1155-1107}{250}\right)^{1/2}}{0.025}$$

$Q = 51.2$ cfs say 50 cfs

Capacity at El. 1117

$$Q = \frac{(0.463)\, 2^{8/3}\left(\frac{1117-1107}{250}\right)^{1/2}}{0.025}$$

$Q = 23.5$ cfs say 20 cfs

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

APPENDIX C

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir

Formation Name: Mauch Chunk Formation.

Lithology: Grayish red to red-brown, and pale brown medium grained sandstone, with lesser amounts of similarly colored siltstone and shale.

Structure

The dam is located on the axis of the Coal Ridge syncline, which trends about N65°E here. The beds dip gently toward the axis.

Air photo fracture traces trend: N10° to 20°W, N30°W and N10°E.

Overburden

According to the core boring logs, the valley of Whiskey Mill Run had an alluvial fill consisting of clayey sand and sand and gravel, up to 22 feet thick. Cover on the valley sides was three to five feet thick and consisted of clay and boulders. The logs indicate that the bedrock below the overburden was much fractured.

Aquifer Characteristics

While some of the sandstone units in the Mauch Chunk Formation may have some primary porosity and permeability, most, if not all, ground water movement is along bedding planes and fractures. Since the grains and cement of the rock are essentially insoluble minerals, there is little chance of enlargement of fracture openings by ground water movement.

Discussion

This dam was constructed with a concrete cutoff wall. The trench for this wall was dug 8 to 15 feet into bedrock.

Some leaks are reported at this dam. These are probably due to ground water movement along bedding planes and fractures, below the cutoff wall and grout curtain. Because of the insoluble nature of the bedrock it is unlikely that continued leakage will cause any widening of openings or deterioration of the rock.

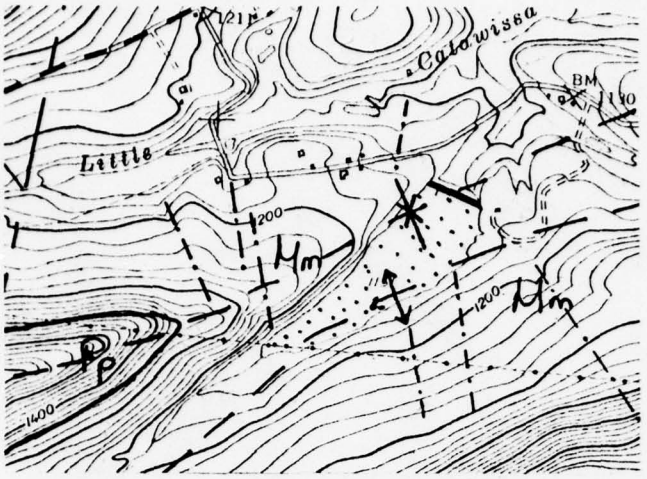
Sources of Information

1. Arndt, H.H. (1971) "Geologic Map of the Ashland Quadrangle". U.S. Geologic Survey, Map G.Q. 918.

2. Air photographs, scale 1:24,000, dated 1969.

3. Core borings logs in file.

GEOLOGIC MAP - KINGTOWN DAM #6



(geology from U.S.G.S. Map GQ-918)

KEY

Pp	Pottsville Fm.
Mm	Mauch Chunk Fm.
	anticlinal axis
	synclinal axis
	air photo fracture trace

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

SCALE 1:24000

1 0 1 MILE

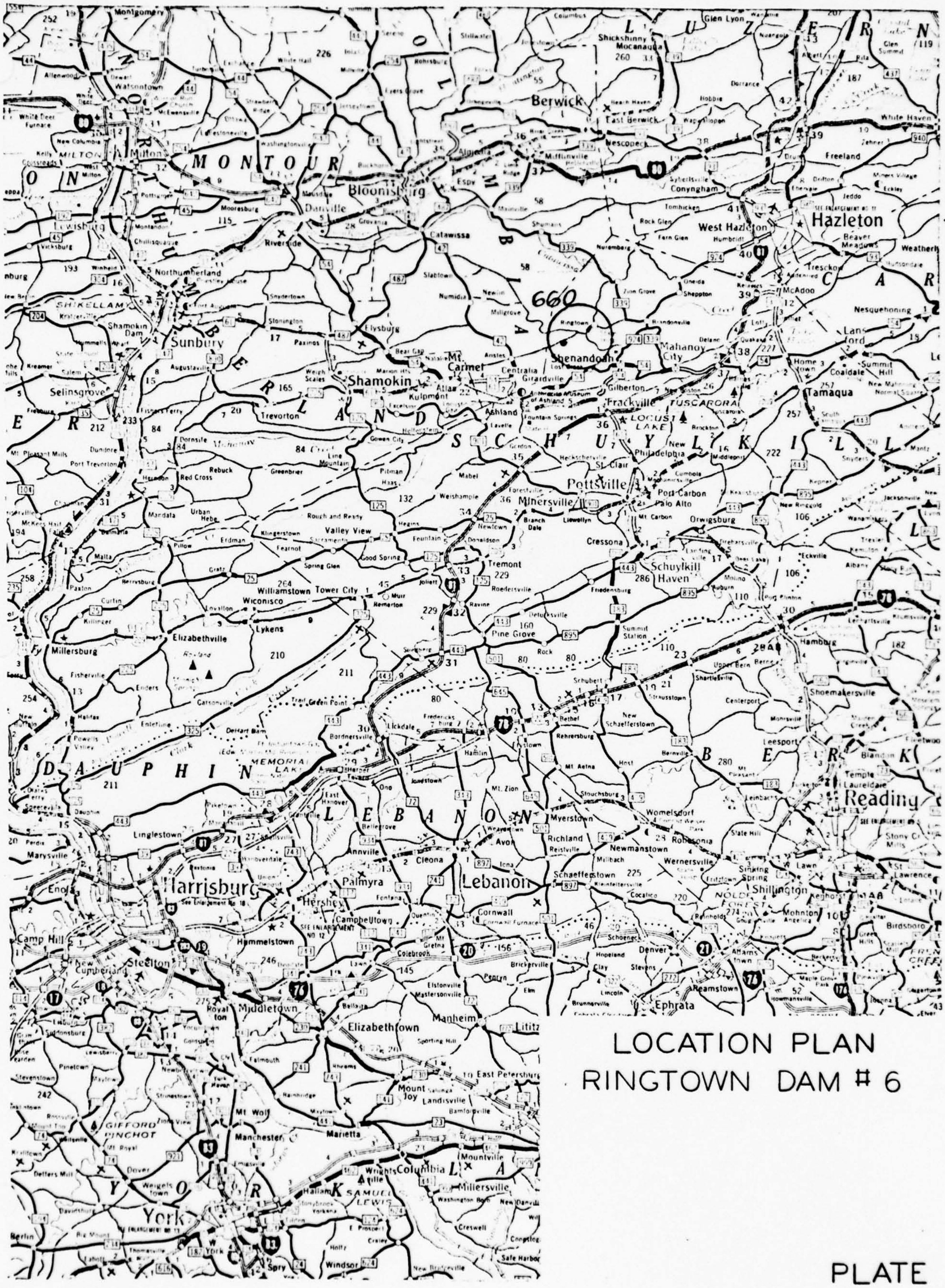
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

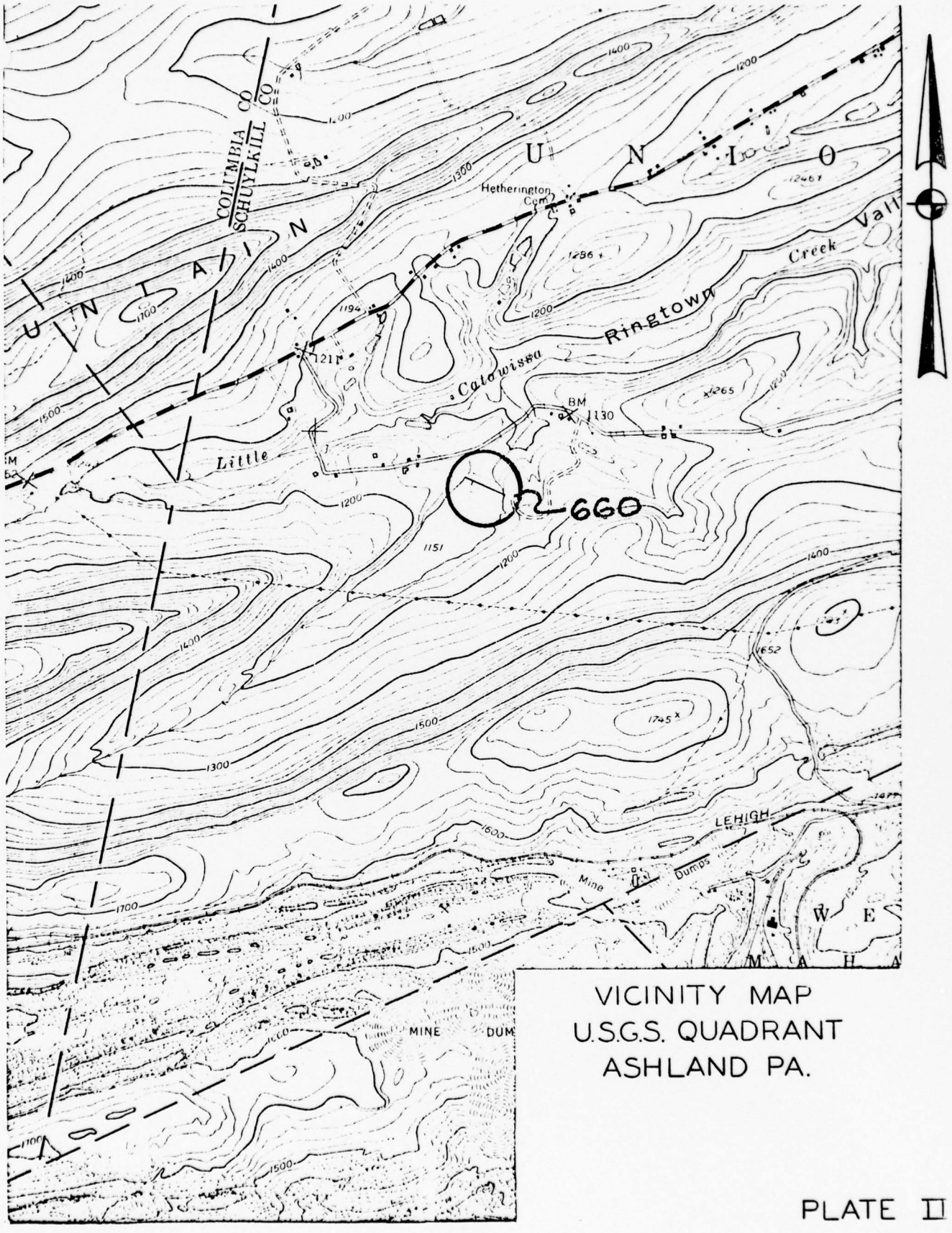
APPENDIX D

LOCATION, PHOTOGRAPHS & DESIGN DRAWINGS



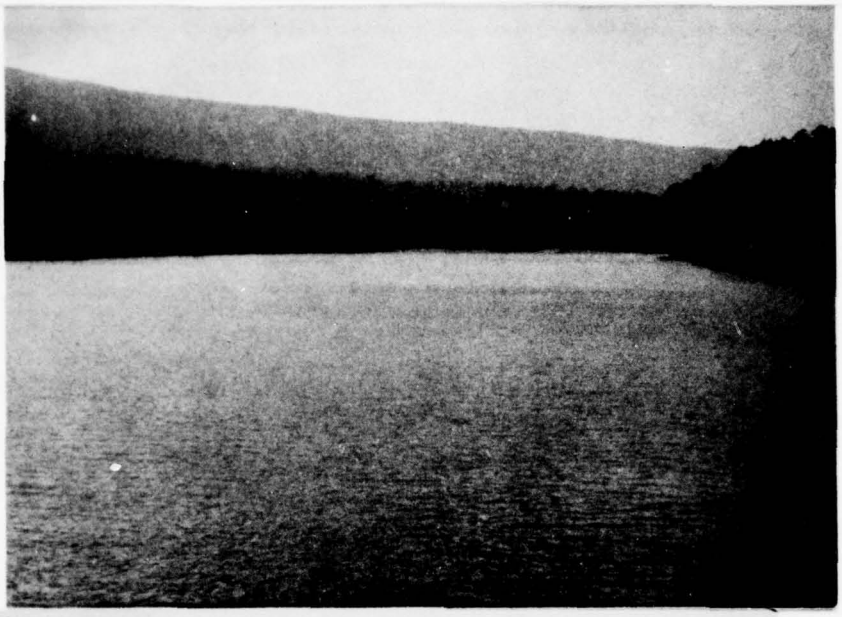
LOCATION PLAN
RINGTOWN DAM # 6

PLATE I

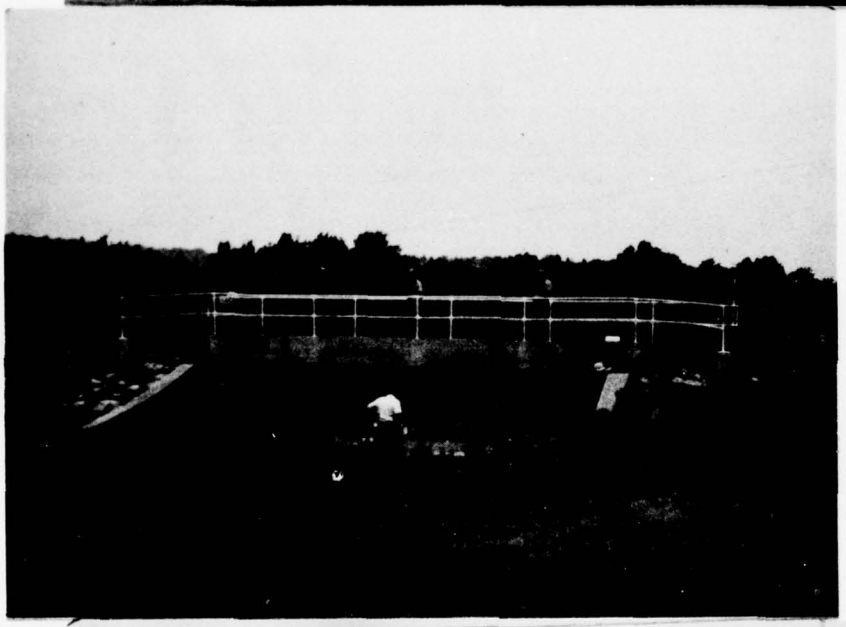


VICINITY MAP
U.S.G.S. QUADRANT
ASHLAND PA.

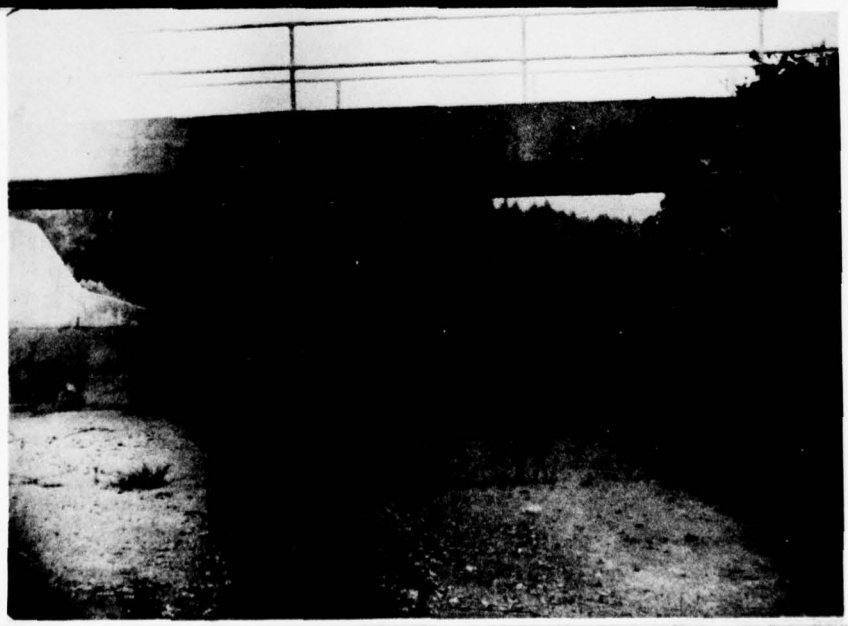
PLATE II



Reservoir



Spillway
Bridge



Spillway
Ogee

PLATE III

Spillway Channel

Spillway Channel
Looking Upstream

Spillway Wall
Deterioration

PLATE IV

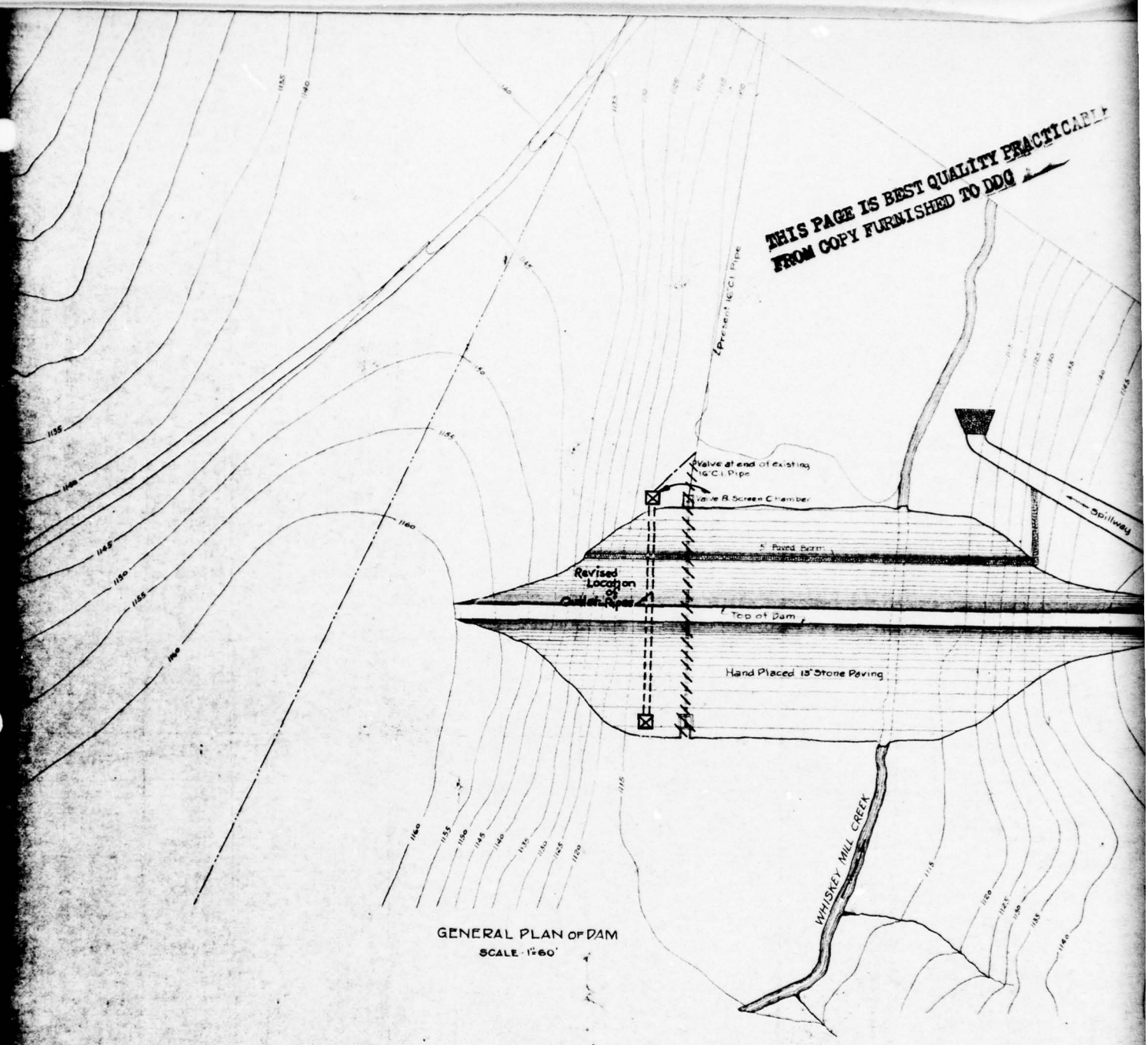
Downstream Channel

Downstream Slope

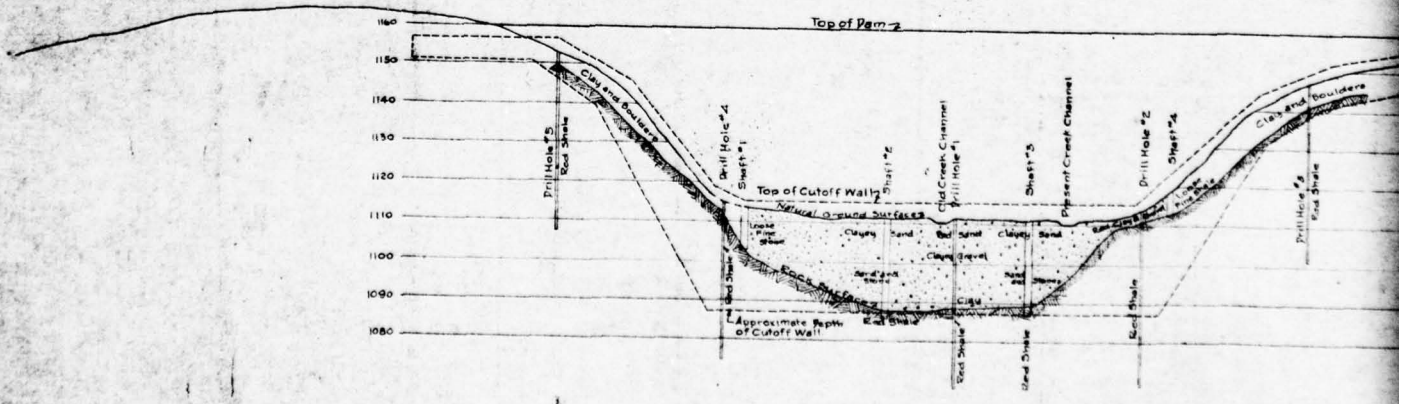
Growth on
Downstream Slope

PLATE V

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

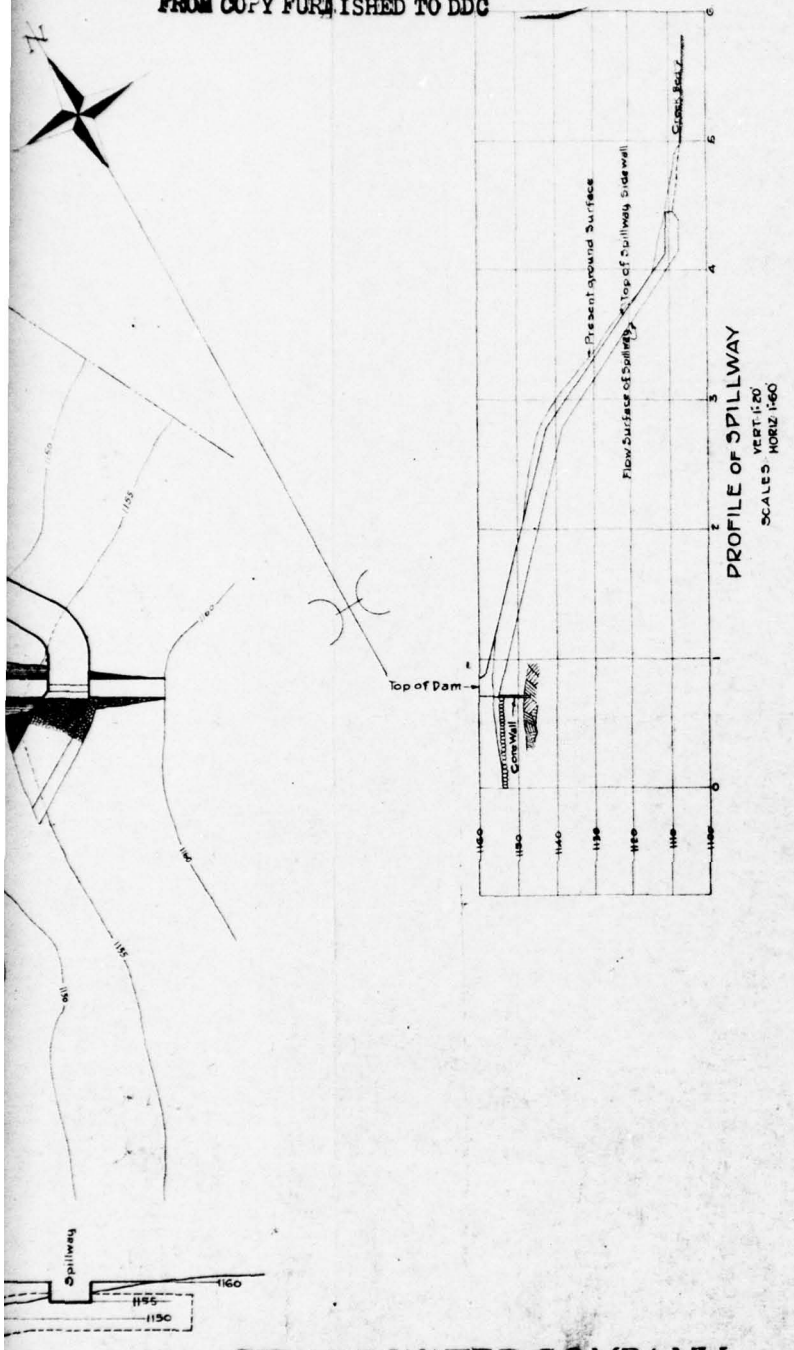


GENERAL PLAN OF DAM
SCALE 1"=60'



CROSS SECTION AT SITE OF DAM
SCALES VERT. 1"=20'
HORIZ. 1"=60'

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



GIRARD WATER COMPANY
POTTSVILLE, PENNA
DAM AND STORAGE RESERVOIR N°6
ON
WHISKEY MILL CREEK SCHUYLKILL CO, PA.

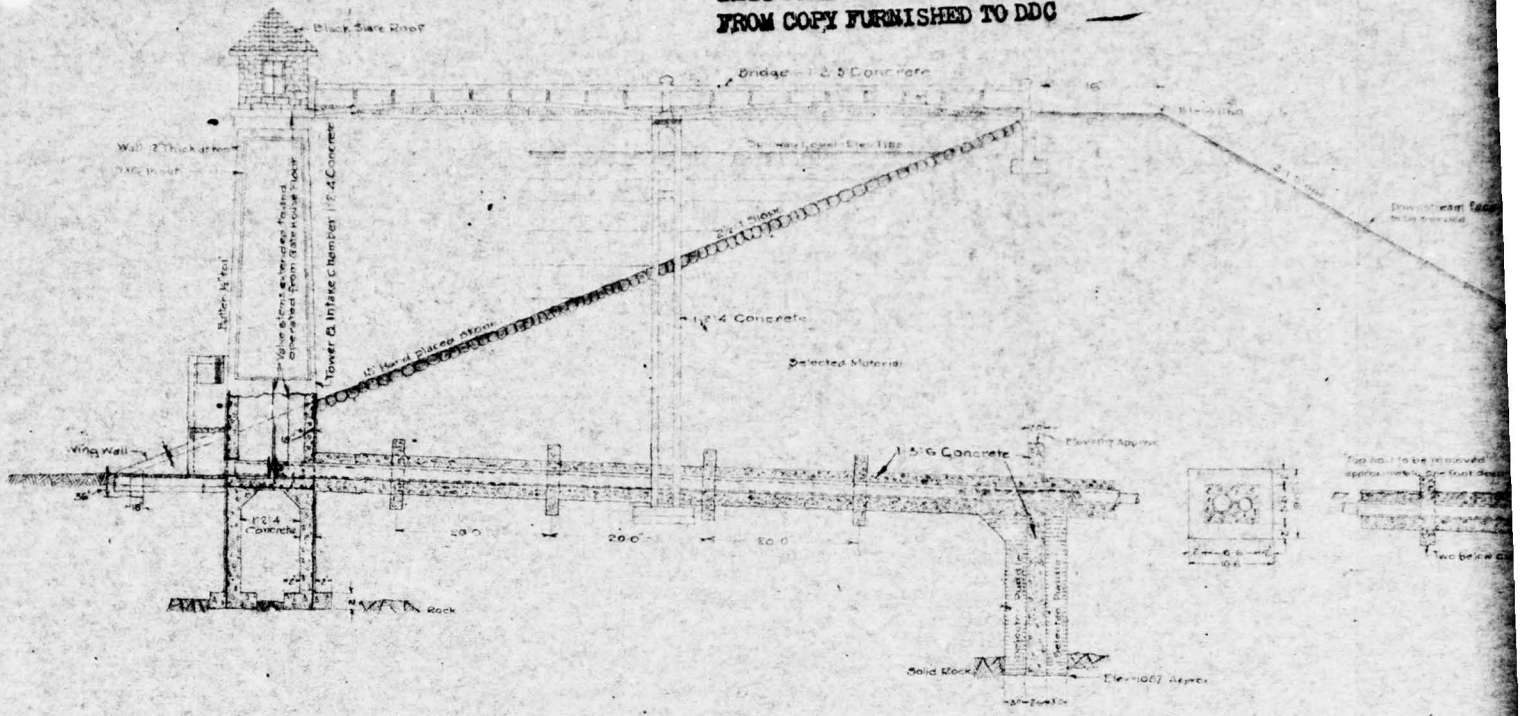
PLAN AND ELEVATION
OF
DAM AND SPILLWAY
SCALES - AS SHOWN

GANNETT, SEELYE & FLEMING
ENGINEERS HARRISBURG, PA.
MARCH, 1919

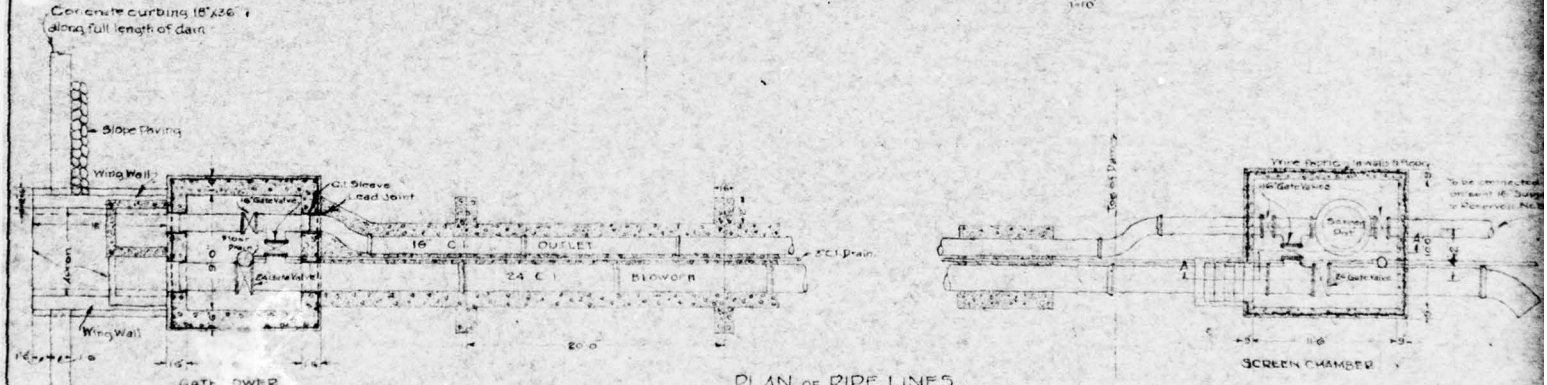
2

PLATE VI

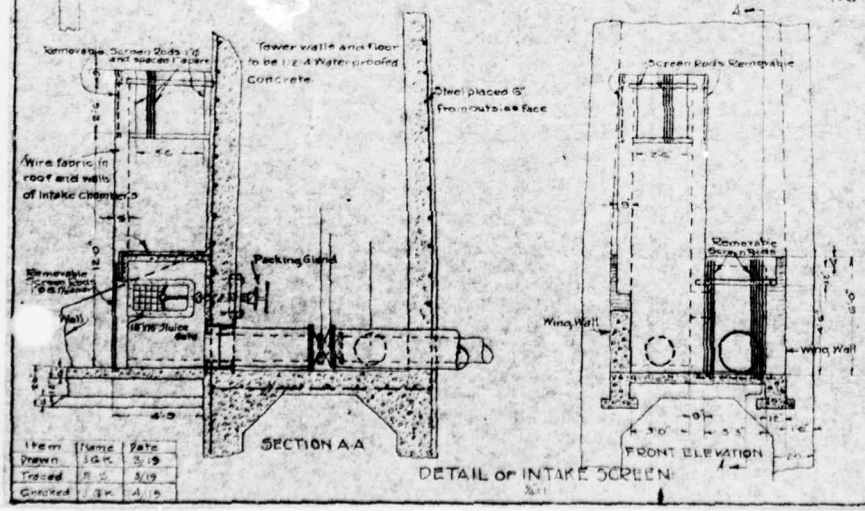
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



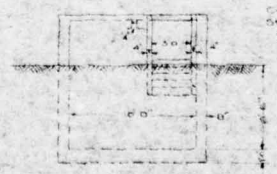
SECTION THRU EMBANKMENT



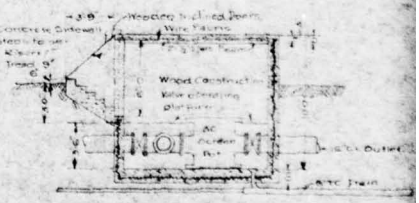
PLAN OF PIPE LINES



DETAIL OF INTAKE SCREEN



END ELEVATION OF SCREEN CHAMBER

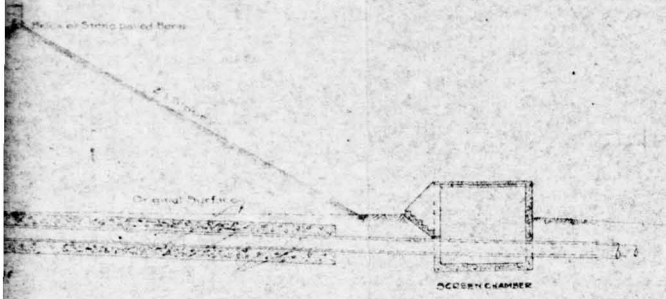


VERTICAL SECTION A-A

Item	Name	Date
Drawn	J.G.K.	3/19
Traced		3/19
Checked	J.K.	4/19

660

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



BILL OF MATERIAL
CAST IRON PIPE, SPECIALS, VALVES

PIECES	LENGTH	SIZE	DESCRIPTION	WEIGHT TONS	WEIGHT POUNDS
1	2 Ft	16 in	Cast Iron Pipe Flanged Class 'C'		794
2	"	"	Bell & Spigot 2 Offset " "	0.97	
1		16x16	Tee 2 Flanges 1 Spigot on Run Class 'D'		750
18	12 Ft	16 in	Bell & Spigot Cast Iron Pipe Class 'C'	16.33	
2	"	"	Flanged & " " " " "	1.65	
17	"	24 "	Bell & " " " " "	28.5	
2	"	"	Plain end " " " "	3.14	
1	4½			0.65	
1		24x18	Tee 2 Flanges 1 Spigot on Run Class 'D'	0.75	
1		24 in	45° Ell Bell & Spigot	0.75	
2			Sleeves	0.82	
2		6 "	"		886
1		36 "	Screen Pipe (U.S.C.I. Pipe & Foundry or equal)	16.5	
5		16 in	Gate Valves Flanged		
2		24 in	" " "		
15	16 Ft	30 in	Bell & Spigot Cast Iron Pipe Class 'A'	1.75	
2		12 in	Cast Iron Floor Drains		50
			Pig Lead	1.1	
1		16 in	Tee Flanged		740
1		24x16	" "	0.72	
			Sheet for Intake Screens	0.80	
1	15'-1"	15"	Sluice Gate (Chapman or Equal)		

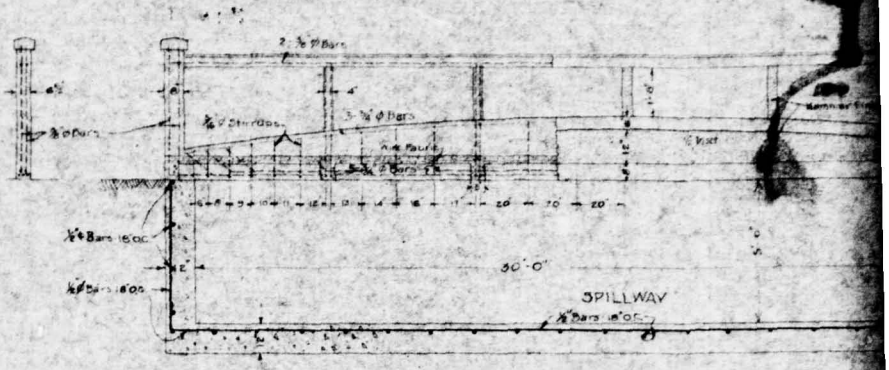
GIRARD WATER COMPANY
POTTSVILLE, PENNA
DAM AND STORAGE RESERVOIR No 6
ON
WHISKEY MILL CREEK SCHUYLKILL CO., PA.

SECTION THRU DAM
AND
PIPING DETAILS
SCALES AS SHOWN

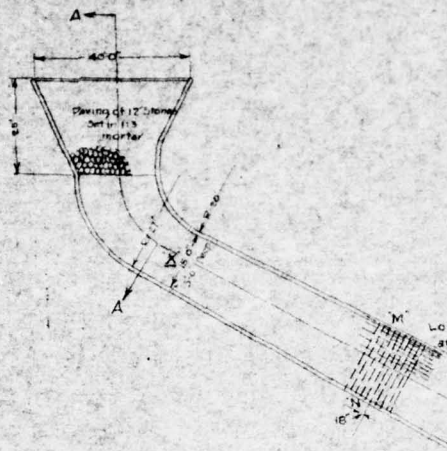
GANNETT FLEMING & FLEMING
ENGINEERS HARRISBURG, PA
MARCH 1919

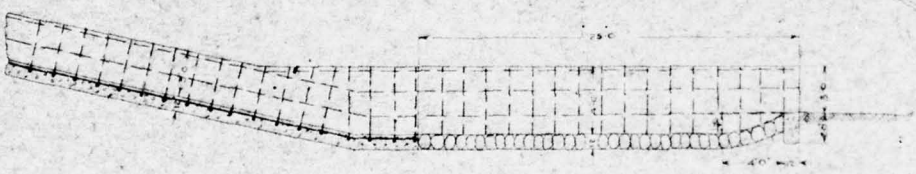
PLATE VII

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

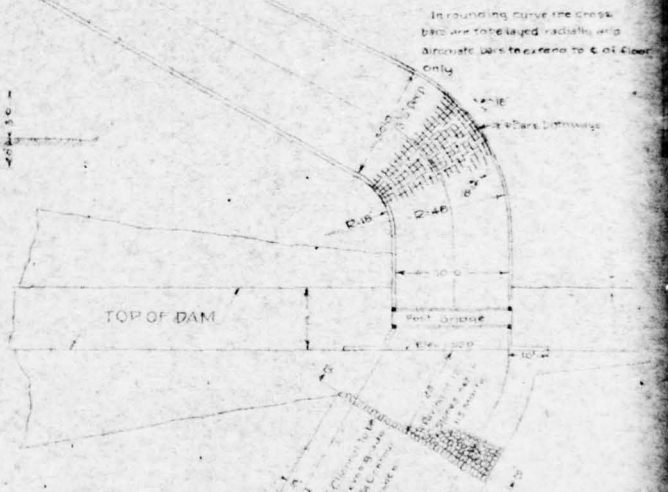


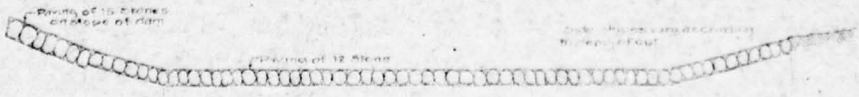
LONGITUDINAL SECTIONAL ELEVATION
SPILLWAY BRIDGE





SECTION A-A OF APRON



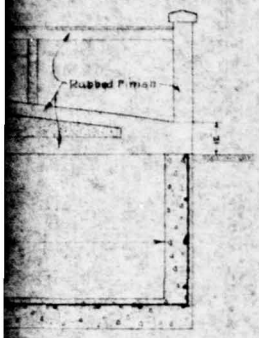


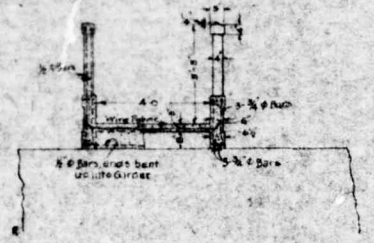
SECTION B-B SPILLWAY ENTRANCE

PLAN OF SPILLWAY

660

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC





CROSS SECTION
OF
SPILLWAY BRIDGE
SCALE- ½" 1'

STEEL FOR SPILLWAY BRIDGE

Pieces	Size	Length
Girders-Bottom Steel		
4	¾ ⌀	31'-8"
2	"	31'-6"
2	"	30'-0"
2	"	28'-0"
Girders-Top Steel		
6	¾ ⌀	31'-0"
Stirrups		
4	⅜ ⌀	2'-8"
4	"	2'-0"
4	"	3'-0"
4	"	3'-2"
4	"	3'-4"
4	"	3'-6"
4	"	3'-10"
4	"	4'-2"
4	"	4'-4"
4	"	4'-6"
4	"	4'-10"
Floor Slab		
Wire Fabric 31" wide - 85#		

Pieces	Size	Length
Posts & Floor Beams Intermediate		
10	½ ⌀	13'-0"
10	"	13'-4"
End Beams		
2	½ ⌀	5'-3"
2	"	4'-9"
End Posts		
6	⅜ ⌀	5'-0"
Hand Rail		
12	⅜ ⌀	11'-0"
Spillway		
2000 ft	½ ⌀	

GIRARD WATER COMPANY
POTTSVILLE, PENNA
DAM AND STORAGE RESERVOIR Nº6

ON

WHISKEY MILL CREEK SCHUYLKILL CO., PA.

DETAILS
OF
SPILLWAY AND BRIDGE

SCALES-AS SHOWN

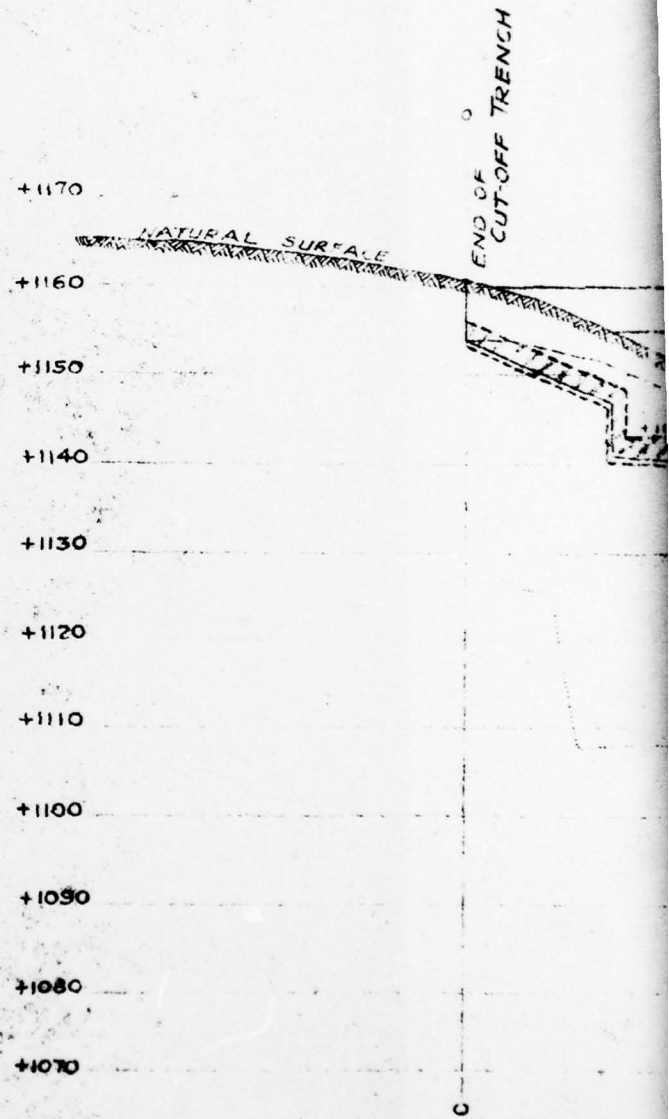
GANNETT, SEELYE & FLEMING
ENGINEERS HARRISBURG, PA.

MARCH, 1913

2

PLATE VIII

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



RESERVOIR NO. 6
OF
THE GIRARD WATER COMPANY
Cross Section through Embankment

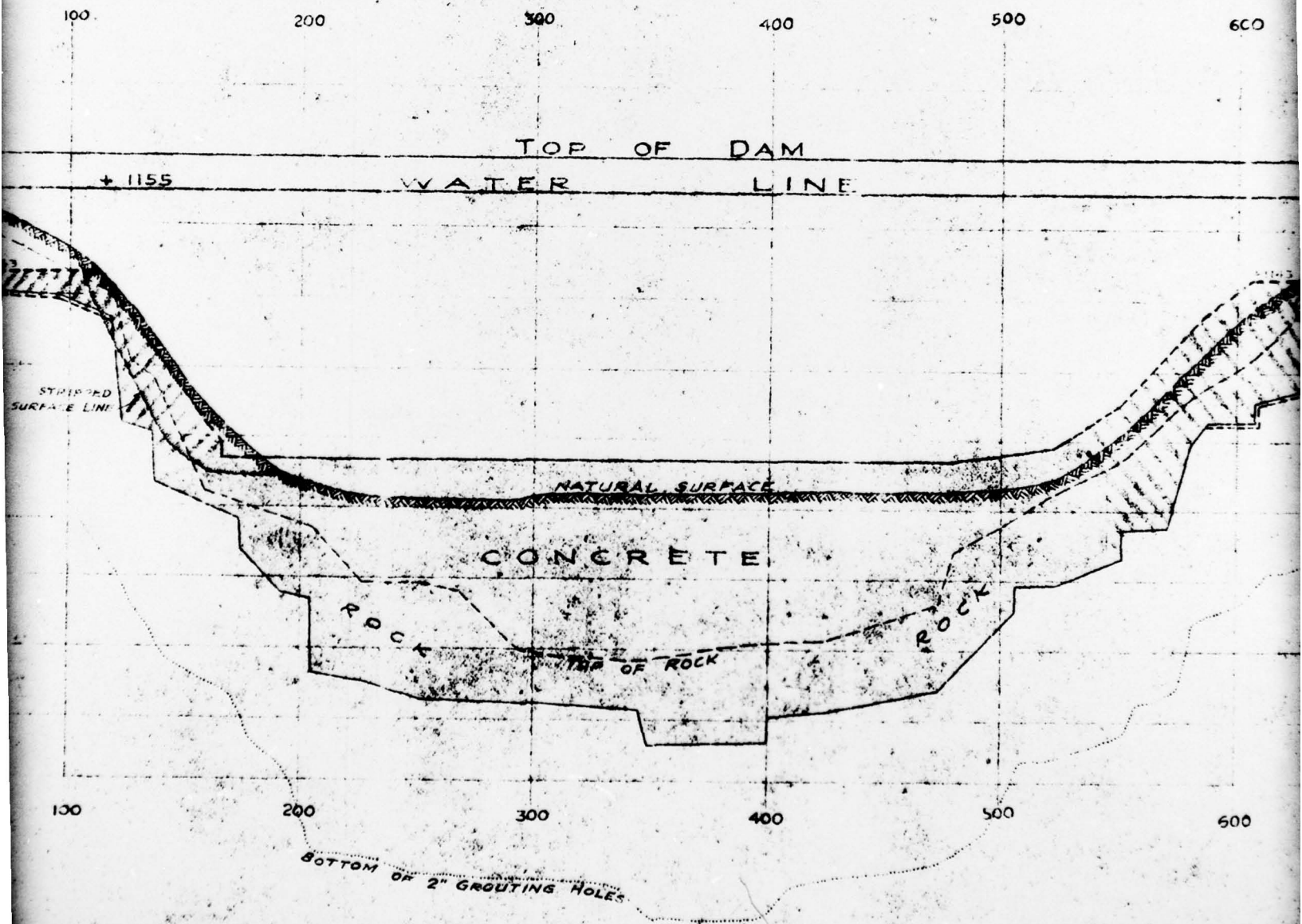
Scale 1" = 60' Horizontal
20' Vertical

Pottsville, Pa.,
June 15, 1920

James Archbald
GENERAL MANAGER

THIS PAGE IS BEST QUALITY PRACTICABLE
COPY FURNISHED TO DDC

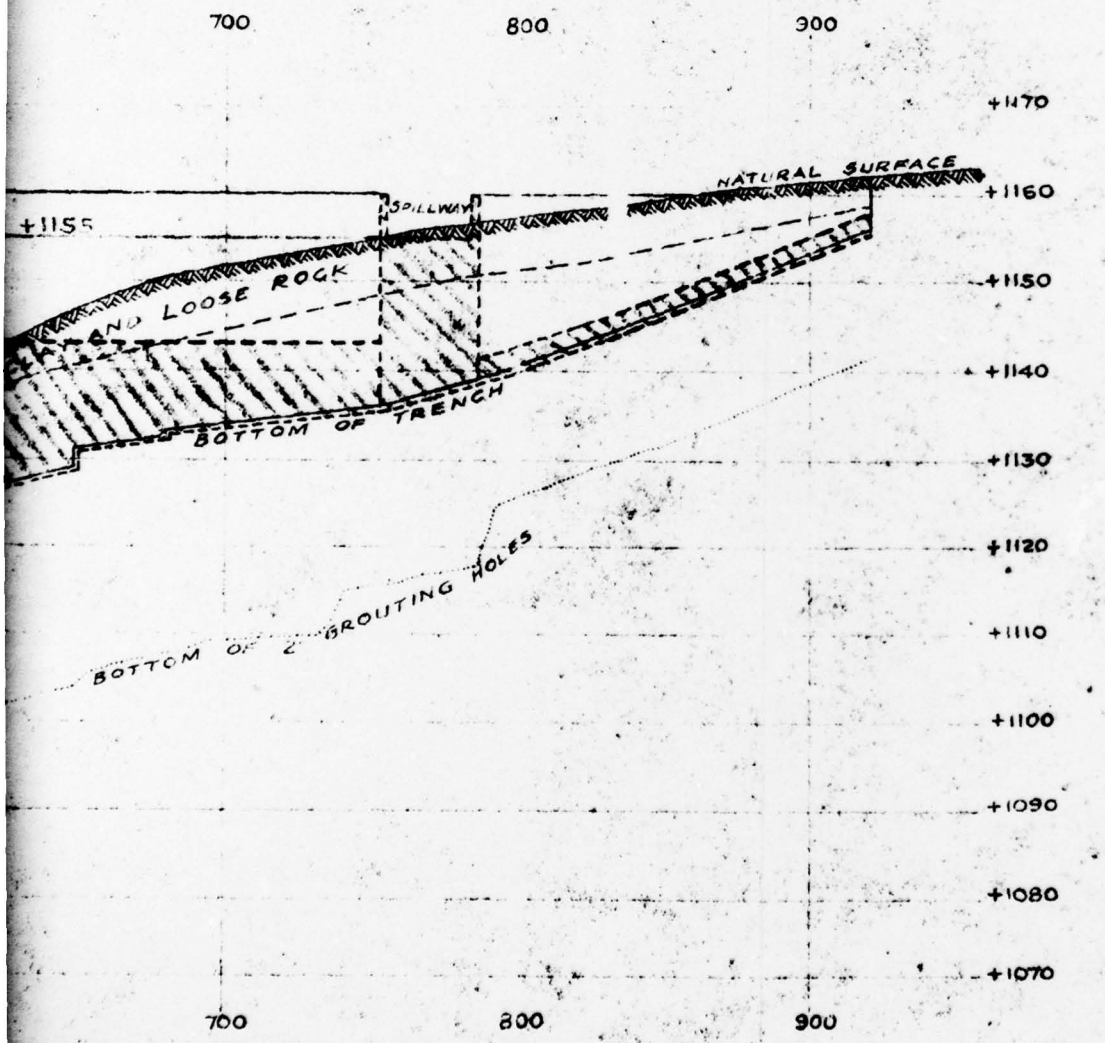
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



2

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

THIS PAGE IS BEST QUAL
FROM COPY FURNISHED TO



NOTE:
Cross Hatched
concrete still

ITY PRACTICABLE
DDC

area represents
be placed

PLATE IX 4

APPENDIX E

INSPECTION REPORTS

9) Spillway abutments O.K. (10) Spillway crest

11) Obstruction in spillway None. (12) Wasteway channel O.K.

13) Condition at outlets O.K. Oct. 4, 1923

14) ndition at lower toe O.K.

15) General appearance Good. (16) Maintenance Good.

17) Defects, if any No. 2 and No. 7:-On August 21, 1922, with water in the reservoir at an elevation of 10" below the spillway, or at gage elevation 41' 2"a large leak of blow out occurred at the left or south end of the dam; the leakage amounted to 4" on a 12" weir. By 7 P.M. the reservoir had dropped to elev.40' 5". At six A.M. on A ug. 22 the water had dropped to elev. 39' 2" with 3 5/16" on the weir. This weir is called the north weir; there are also weirs at the middle of the valley "c" and one at the foot of the waste channel "s". The following are for the dates shown:-

(Here describe defects)

I recommend that the owner be advised as follows:

Date	Elevation of water surface in reservoir.	Amount of water flowing over weirs. "n"	"c"	"s"
ug.22,'22 ..30 P.M.	38' 10"	2 13/16"		
Aug.23,'22		2 5/16"	1 11/16"	
Aug.25,'22	38' 5"	1 15/16"	1 12/16"	
Aug.27,'22	38' 6"	2 1/16"		
Aug.29,'22	38' 1"	1"	1 6/16"	
Aug. 2,'23	27' 10"	3/16"	4/16"	12/16"

The north weir dries up with water in the reservoir at elev. 30' except for a small amount of water flowing from the gate house. An attempt is being made to stop this leakage by grouting the loose rock surface of the left hillside immediately upstream from the dam; the method being used is as follows:- holes are made at frequent intervals by driving bars to refusal, usually to a depth of about five feet then grout is allowed to run into these holes, filling the cracks and revices below. This may help to stop the leakage but the writer thinks a better method would be to drill deep holes on the line of the cutoff and grout through them; this would reach the deeper cracks beyond the end of the dam and would probably be more effective;

Four (4) inches on May 12,1924.

June 1, 1924

OUTLETS

9. Are all outlet pipes or conduits in good condition; if not, describe defects.

Yes

LEAKAGE

10. Describe the location and amount of leakage, seepage or springs through, under or around the dam and state whether or not they appear to be increasing or decreasing; also advise whether water is clear or muddy and whether it has been measured. If it has been measured give the date and the amount of the latest measurement.

There is seepage through the red-shale strata at both ends of the dam, the quantity varies with the different depths of water. On the north end, with the reservoir overflowing, the seepage, measured on May 22,192[illegible] amounted to 172,279 gallons in 24 hours. On August 31st., 1922, with the water level 3 feet 7 inches below the spillway, the seepage was 247,553 gallons in 24 hours, the decrease is due to some grouting which was done inside of the dam. The seepage on the south end of the dam, measured on May 26th.,1924, was 473,790 gallons in 24 hours, as compared with 146,433 gallons on May 8th.,1924, the reservoir being full of water on both dates. On May 24th., additional drain pipe was put in to carry the water to a weir resulting in the increase probably by concentrating water which may have followed other courses and not passing through the weir. There has been no increase for the last three (3) days. The seepage at both ends of the dam is always clear.

11. What has been the variation in elevation of the water surface in the reservoir referred to the crest of spillway during the year?

Maximum depth of water is 42 feet. Water depth during the year varied between 37 feet 10 inches and 42 feet.

(Here insert names of Officials of company, including names of Engineer and any others that may accompany Engineer when inspection is made.)

(1) Crest O. K. (2) Ends: left O. K. right O. K.

(3) Upstream face See below (4) Downstream face O. K.

(5) Settlement See No. 3

July 27, 1928

(6) Elevation of water surface referred to spillway crest - 6 inches

(7) Leakage See below (8) Spillway approach O. K.

(9) Spillway abutments O. K. (10) Spillway crest O. K.

(11) Obstruction in spillway None (12) Wasteway channel O. K.

(13) Condition at outlets O. K.

(14) Condition at lower toe O. K. See No. 7

(15) General appearance Good (16) Maintenance Good

(17) Defects, if any

(Here describe defects.)

No. 3. The upstream slope is uneven near the right end left of the spillway; this may be due to improper compacting behind the left abutment of the spillway.

No. 7. The leakage over the south or right hand weir amounts to about 4.5 inches on a 12-inch weir. The leakage over the other weirs is said to be about 6/16 or 7/16 for the center weir and about 1-2/16 for the north weir. These weirs were out of commission at the time of the writer's examination. This leakage is said to be about the same as has existed here for some time. The water which appears on the ~~north~~ south weir can be heard running under or to the right of the gutter at the junction of the right hill and the dam at an elevation about 15 feet above the bottom. Water appears at the foot of the channel in several places. The surface of the downstream slope is wet near the middle, at the toe, and about 8 or 10 feet above. A pipe has been inserted at this point and the seepage noted is said to be decreasing.

(1) Crest O. K. (2) Ends: left O. K. right O. K.

(3) Upstream face O. K. (4) Downstream face See note

(5) Settlement None

AUG. 11, 1931

(6) Elevation of water surface referred to spillway crest - 4½ feet

(7) Leakage See note (8) Spillway approach Clear

(9) Spillway abutments O. K. (10) Spillway crest O. K.

(11) Obstruction in spillway None (12) Wasteway channel O. K.

(13) Condition at outlets O. K.

(14) Condition at lower toe O. K.

(15) General appearance Good (16) Maintenance Good

(17) Defects, if any

(Here describe defects.)

No. 4. The previously saturated places on the downstream face were completely dry, tho showing old moss.

No. 7. Left weir 1-5/8" equal .14 ft.

Center weir 13/16" equal .07 ft.

Right weir 2½" equal .21 ft.

The above were the weir measurements at the time of examination showing less leakage than in 1929. This reduction may be accounted for by the lower water level; but Mr. Horner stated that the leakage reduced at the same time that the saturated lower face dried up, when the water was lowered several feet and then raised again last year.

The crest of the center weir was not level.

(1) Crest OK (2) Ends: left OK right OK

(3) Upstream face OK (4) Downstream face OK

(5) Settlement See note Oct. 10, 1934

(6) Elevation of water surface referred to spillway crest - 5'

(7) Leakage See note (8) Spillway approach Clear

(9) Spillway abutments OK (10) Spillway crest OK

(11) Obstruction in spillway None (12) Wasteway channel OK

(13) Condition at outlets See No. 7

(14) Condition at lower toe Fair

(15) General appearance Good (16) Maintenance Good

(17) Defects, if any

(Here describe defects.)

No. 5. In August 1933, a hole 10 feet square fell in on the upstream face 100 feet from right end. When repairs were made, extensive undermining was found. The fill was tunnelled, and refilled for a total length of 75 feet, clay being tamped along both sides of core wall, and raised to crest for length of 40 feet. A grout pipe with tees 4 feet center to center was left in the new fill, which was grouted at 170 pounds pressure, 12 to 15 tons cement being forced in. The repairs were made by Gannett, Seelye and Fleming, and cost $6,000.00.

No. 7. Small stream from right side of blow-off channel may come from leaky valves in gate house. The left weir runs 1/2 inch deep; center weir 5/8 inch; right weir 1-1/4 inch. (There was a heavy rain 22 hours before.) Most of the latter emerges from the base of the hill at the right end.

Examined on May 7, 1941

In company with Mr. T. S. Wragg, Foreman
(Here insert names of Officials of company, including names of Engineer and any others that may accompany Engineer when inspection is made.)

(1) Crest OK (2) Ends: left OK right OK

(3) Upstream face OK (4) Downstream face Some brush

(5) Settlement None MAY 13, 1941

(6) Elevation of water surface referred to spillway crest Minus 8 inches

(7) Leakage See note (8) Spillway approach Clear

(9) Spillway abutments OK (10) Spillway crest OK

(11) Obstruction in spillway None (12) Wasteway channel Slightly disintegrated

(13) Condition at outlets Leakage

(14) Condition at lower toe Fair

(15) General appearance Good (16) Maintenance Fair

(17) Defects, if any
(Here describe defects.)

(7) There was approximately ½ inch flowing over the weir below the left end.

The weir below the center and below the right end were both washed out.

There was a large flow coming from the right end or in back of the left wasteway wall which would not pass over the right weir.

Mr. Wragg was informed that it would be necessary to replace these weirs and take regular readings of the flow.

PRESENT CONDITION

MAY 14, 1945

Examined on May 9, 1945

In company with Mr. J. A. Laudeman, Caretaker.
(Here insert names of Officials of company, including names of Engineer and any others that may accompany Engineer when inspection is made.)

(1) Crest Brush (2) Ends: left OK right OK

(3) Upstream face Brush (4) Downstream face Brush

(5) Settlement None

(6) Elevation of water surface referred to spillway crest Plus one inch

(7) Leakage See note (8) Spillway approach OK

(9) Spillway abutments OK (10) Spillway crest See note

(11) Obstruction in spillway None (12) Wasteway channel See note #10

(13) Condition at outlets Slight leakage

(14) Condition at lower toe OK

(15) General appearance Fair (16) Maintenance Fair

(17) Defects, if any
(Here describe defects.)

(7) Considerable amount of leakage throughout lower toe also along left wasteway wall. Attempts were made to install weirs to measure the leakage. The weirs are of no value as they are leaking badly and only a small portion of the water flows over them. There are 3 weirs.

(10) The spillway crest and wasteway walls and floor are badly cracked and disintegrated.

INSPECTION REPORT

No. of Dam 54-95

Date 5-21-62

The following is a report based upon the inspection of the No. 6 Dam across Whiskey Mill Creek in Union Township, Schuylkill County, owned by Municipal Authority of the Borough of Shenandoah.

Type earth Height 50 feet

Storage 270 mil. gal. Drainage area 2.0 sq. mi.

Damage caused by failure property damage and possible loss of life.

PRESENT CONDITION

Examined on 5-17-62 In company with self

1. Crest ok 2. Ends: left ok right ok

3. Upstream face ok 4. Downstream face trees & brush 5. Settlement none 6. Elevation of water surface referred to spillway crest 2" below 7. Leakage around outlet and 150' to the right

8. Spillway approach ok 9. Spillway abutments See remarks

10. Spillway crest ok

11. Obstruction in spillway none 12. Wasteway channel ok

13. Condition at outlets ok

14. Condition at lower toe trees and brush

15. General appearance fair 16. Maintenance fair

17. Defects, if any

REMARKS:

The right abutment of the spillway, for a distance of about 10 feet, is breaking away just below the bridge. Caretaker says they plan to repair this summer.

Recommendation:

Notify owners to remove trees and brush and to repair the spillway abutment.

Respectfully submitted,